FIELD MUSEUM OF NATURAL HISTORY

COLLECTIONS AND RESEARCH

1990 REPORT

TO

THE BOARD OF TRUSTEES

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by Zorica Dabich

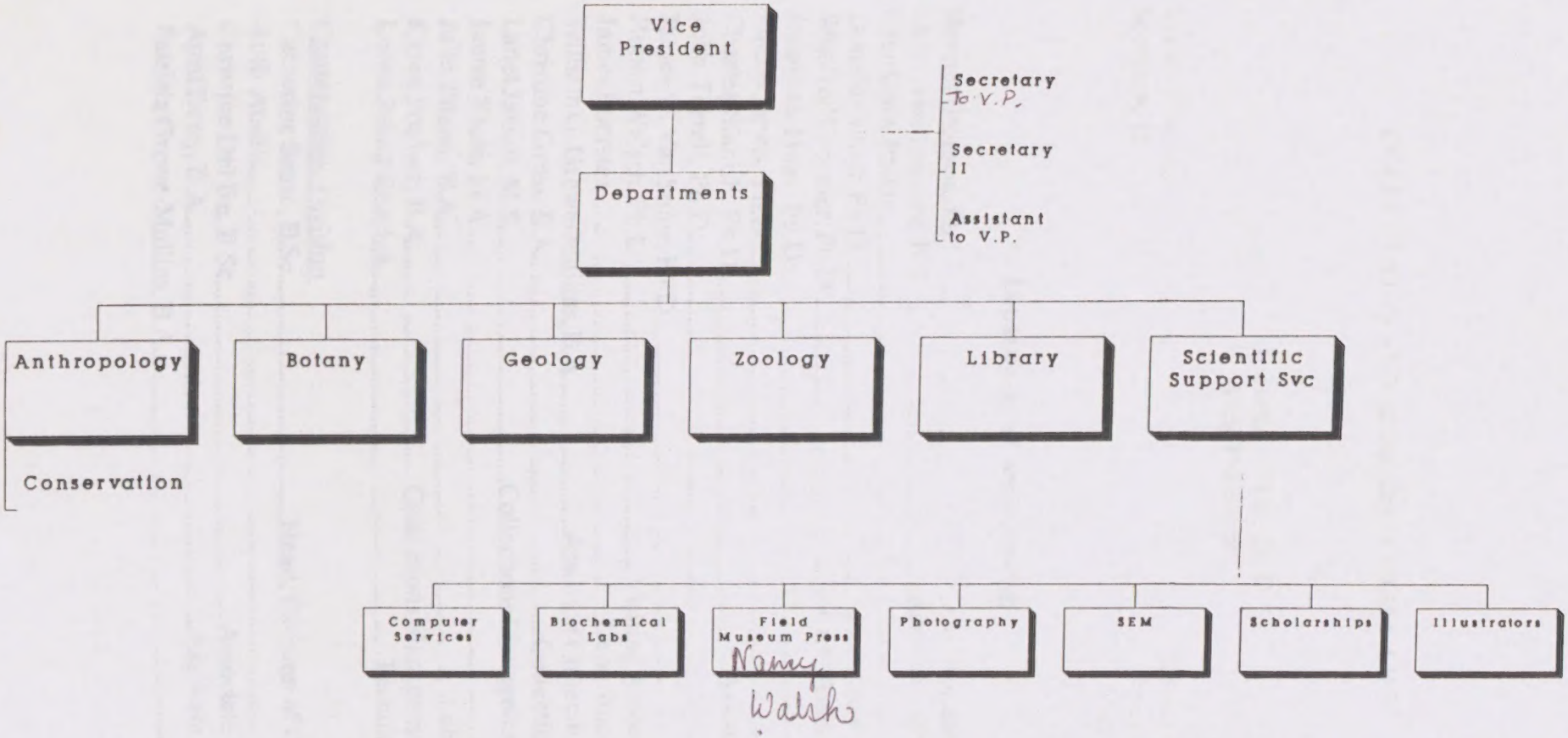
Jonathan Haas
Vice President
Collections and Research
Field Museum of Natural History
Chicago, Illinois 60605-2496

FIELD MUSEUM OF NATURAL HISTORY
COLLECTIONS AND RESEARCH

Report to the Board of Trustees
1990

CONTENTS

COLLECTIONS AND RESEARCH



1990

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Linnea Lahlum, B.A.....Scientific Illustrator

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Jeanne Zornada, B.A./Linda Dorman, B.A.....Darkroom Technician

*Second listing. Name appears already in staff list.

BEETLES, BRYOPHYTES AND ANCIENT BONES: THE FUTURE OF RESEARCH AT FIELD MUSEUM

What is the future of scientific research at Field Museum? How is the research at a major museum different from research at a large university? What is the distinctive role that collections-oriented research programs at an institution such as ours can play in the broader fields of biology, geology and anthropology? What contribution can and should we be making toward addressing critical natural and social issues facing the nation and world today? As one of the great museums of the world with comprehensive, global collections, these questions are central to the mission of the Research and Collections Division of Field Museum. These questions have come to the forefront in the past year as a result of a number of events, and have stimulated a broad reexamination of our research objectives, particularly in the biological sciences.

First, we had three curatorial openings in the Zoology Department, and to gain advice on how these positions should be filled, we commissioned an external review of the Department. This review committee was composed of three zoology curators from other major museums and a professor of paleontology from the University of Chicago. They came in for two days and met with members of the Department and administration and ultimately gave us a report that provided a welcome, fresh, "outsiders" perspective on departmental organization and the research programs of the curatorial faculty. This review helped in our decision to hire two new assistant curators in malacology, and has helped focus our attention on critical issues in initiating a search for a new curator in ichthyology.

In the Botany Department we initiated planning for a new position in conservation biology. This will not be an additional curatorial position for Botany, but rather a new kind

of position for Field Museum. The conservation biologist will have primary responsibilities for doing active botanical collecting in the field and will give the Field Museum a more active voice in the conservation community.

In the Geology Department, we continue to struggle with serious questions about the balance between paleontology and the earth sciences. This is an issue that will be taken up directly in 1991 when we have an external review of the department and again invite in curators and professionals from outside the museum to review and evaluate the program.

Finally, in addition to the specific issues in individual departments, a general concern over the status and stature of museum-based research and systematic collections in the larger community of biology has stimulated our active discussion of the future of research at Field Museum. There has been serious discussion in both the professional literature and the national press about the health of science and science education in general in the United States today and about the specific difficulties being faced by museum-based science in particular.

In evaluating where we are and where we are going, we continue to recognize that the comprehensive collections of Field Museum stand at the very heart of our mission as a scientific institution. The collections distinguish us from most major universities, and collections-based research distinguishes our research from other subfields in biology. Our curators build new collections and study existing collections in order to answer critical questions about the evolution, ecology, geography and diversity of various groups of plants and animals around the world.

In general, the biological research on collections at Field Museum and other museums of natural history falls into the field of "systematics". What is systematics? In simplest terms it is a branch of biology that incorporates three levels of inquiry: i) discovery, description and classification of biological diversity; ii) interpretation and

definition of the relationships among the world's flora and fauna and iii) explanation of the patterns and processes that we see operating in the evolution of biological systems.

Systematics, in turn, is based on general principles of "taxonomy", which is the orderly classification of plants and animals according to their natural relationships. This orderly classification involves both the naming of species and the placement of species into more inclusive ranks or categories such as genus, family, order, etc. through to kingdom. The taxonomy of systematic biology is really an inference about the history, nature and degree of relationships between various plants and animals. Taxonomy is thus not the end goal of systematics, but a means biologists use to arrive at a better understanding of the natural world.

Comprehensive natural history collections are central to the pursuit of systematics. Systematic biologists need these collections in order to examine similarities and differences within organisms of a particular species, to distinguish different species within similar kinds of organisms, to compare organisms in different ranks and taxa, and to assess changes in the world's flora and fauna over time. Botanists and zoologists can use the collections to look at shorter term change in recent centuries while paleontologists study evolutionary change spanning millions of years.

While systematics is an inherent part of biology, in recent years professional concern has grown over a long-term decline in the community of biologists within the field of systematics. The thrust of a number of recent publications is that systematics is becoming extinct at almost the same rate as the organisms studied in the field. There are many reasons for this decline, among them the immediate allure of conservation itself and exciting technological developments in genetics and molecular biology. University students have been attracted away from systematics by the major funding that is going into the "high-tech" frontiers and the glamour of studying the life and habitat of the known endangered species. At the same time, it must be recognized that the grandfatherly position of systematics at the foundations of biology has been taken for granted, and

there has not been a concerted effort to articulate the central importance of systematics to all of the biological sciences. We have not been very effective in demonstrating to either the scientific community or the general public that systematics remains a critical element in successful biological research.

Yet everywhere we look in biology we can see the importance of systematics. A conservation plan for a region, for example, cannot be constructed without a systematic inventory of the plants and animals that live there. Comprehensive ecological research canot be carried out if we lack the resources to identify the diversity of species whose ecological systems are in question. Biomedical research cannot be conducted without first understanding the taxonomy of the test organisms involved and their natural evolutionary relationships. How the different species of the world evolved cannot be discovered without knowledge of the relationships between those species. Basically, it is impossible to conduct viable biological research without systematics. Inventories, species identifications, the study of natural variation, and the determination of evolutionary relationships are integral components of systematic biology and form the foundation of all modern biology.

There are signs of a resurgence within the systematics community as we enter the 1990s. There are beginning to be more jobs available for systematists, there are more systematics publications carrying more articles than at any time in the past, and the level of funding for systematics research by the federal government is rising. This resurgence is due to an increasing awareness that systematics is indeed central to all the other subfields of biology. Molecular biologists, medical researchers, ecologists, and conservationists alike are finding it difficult to resolve persistent questions without knowing the systematic relationships of the organisms they study.

Other factors contributing to a turn-around in systematics are to be found in dramatic changes in the nature of the research itself, and impressive new techniques provide unexploited new sources of data for systematic studies. For example, systematic

biologists are making use of biochemistry to unlock the genetic code of the organisms they work with, and great advances have been made in marrying systematics with optics and computers. Coincident with these changes in techniques and methods, the philosophical framework within which the data are evaluated has also been altered significantly. In recent years, two very different schools of thought have developed with distinct ways of looking at the data from collections: "cladistics," organization of plants and animals based on their evolutionary relationships, and "phenetics," organization based on the physical and genetic similarity of organisms. These two different approaches have had a great impact on the science of systematics by giving greater substance to species identification and resulting in much more rigorous taxonomic classification systems.

Another recent revolution in systematic biology centers around the physical means of analyzing data. The ease with which scientists today can access powerful computers has made possible a degree of data processing that was unthinkable ten years ago. Statistical tests, computer simulations, and other forms of serious data processing enable rapid and efficient testing of theories to explain patterns of biological evolution. In the last decade a sophisticated microcomputer has become a crucial tool for every systematic biologist. Ten years ago there were only two personal computers in the building at Field Museum, while today every curator and professional staff member has a microcomputer at hand to both record data and process that data efficiently and effectively.

Altogether, computerization, new analytical techniques, and the philosophy of the discipline have combined to effect major change and modernization in the field of systematics. With this relatively recent transformation, there is a growing recognition of the need both to promote and actively demonstrate the vital contribution that is to be made by systematics to the biological sciences and to our understanding of the nature of living systems.

Field Museum in many ways is in an optimal position to assume a leadership role in the reemergence of biological systematics. We have today world class collections in

zoology, botany and paleontology that provide the foundation for research into the evolution and diversity of species from the tropical rainforests of South America to the growing deserts of Africa. In the past ten years the curatorial faculty has been recharged with a commitment to the evolving field of systematics and to the exploration of patterns and processes in the biological universe. There is a challenge before the research community at Field Museum today. We have a challenge to step beyond our individual systematic research goals and actively champion the role of systematics in the broader scientific community as key to the global arenas of conservation, biodiversity, and theories of evolutionary biology.

These challenges are not just for the curators, but for the professional staff, the administration, the exhibit program, the development office and public relations. Working closely with the collection managers, laboratory technicians and other professional staff, the curators have a direct responsibility to communicate clearly the goals and results of research activities to broad professional and public audiences. This communication can take several forms, including active participation in national and international organizations and conferences; publication in specialized journals (such as *Malacologica* or *Bryologist*) and general journals (such as *Journal of Systematic Zoology*, *American Journal of Botany*, or *Science*), public talks, and teaching at one of the local universities. Our curators are also in demand at the University of Chicago, University of Illinois and Northwestern University to teach courses and work intensively with graduate students in systematic biology.

As is illustrated in this report, the scientific community at Field Museum already has an impressive record of publications, grants, lectures and teaching, but we are committed to making a concerted effort to extend our audience in both the public and scholarly sectors.

Paralleling the commitment for better communication, the Office of the Vice President is pursuing a course of active involvement of Field Museum in the national and

international systematics communities; expanding the involvement of Field Museum with local universities to enhance the opportunities for curators to teach and work with students; making new connections with the agencies and foundations involved in biological and cultural conservation and research; and working with others in the various fields in biology to insure greater understanding of and much better funding for collections-based biological research from federal, state, and private sources.

The Vice President and individual departments are also working closely with the Development Office in an effort to generate new sources of income and capital for the Collections and Research Division. This past year we have initiated campaigns to endow chaired curatorships or new research positions in each of the departments; strengthen our biosystematics research thrust with expanded laboratories, technicians and basic research funds; completely renovate the laboratories and preparations rooms in Geology; expand the collections and research facilities for ichthyology and herpetology programs on the ground floor; and complete the financing and initiate construction of the Botany and Geology storage facilities in the east wing of the building.

To complement the efforts to better communicate the results of our research activities, Collections and Research will also be reaching for broader public visibility through both the Public Relations department and the Exhibits program. We are developing a strategy with Public Relations that will raise the profile of Field Museum as part of the Chicago scientific community, and disseminate in an engaging fashion the results of individual research projects to both the scientific and general public. It is our goal to be at the forefront of free-standing museums working on environmental issues vital to global conservation and biodiversity.

While the Public Relations department will help get our message through the media, the Exhibits program offers a direct outlet to communicate the importance of our research programs to students and the general public. With the protocols that have been worked out between Public Programs and Research and Collections we have the full

means in place to insure the scientific accuracy and integrity of every exhibit that is developed and presented to the public. The exhibits in turn further the goals of our scientific programs by showing the public the nature of research done at the museum and ultimately inspiring them to realize the importance of that research in the natural world today. Such exhibits can contribute greatly to science literacy for all citizens, especially school children.

These are exciting times for the Collections and Research Division at Field Museum. As we approach the Centennial celebration of the Field, it seems a good time to reexamine our mission and the direction we wish to take in setting off on a second century. The external review of our Zoology Department was helpful in both reaffirming the quality of our program and offering constructive comments about how we can be even better. We will be conducting similar reviews of the Geology and Anthropology departments in the coming year and Botany the year after. In each case we look forward to the valuable advice of outside colleagues looking in with a fresh and critical eye. At the same time, each department is articulating its own mission and goals for the future, and together we are asking what we want to accomplish as an institution.

When the Field opened in 1894, there were great expectations for what we could accomplish as a scholarly institution. Most of those expectations have been fulfilled and indeed exceeded. We are now poised to go into the next hundred years with a renewed sense of excitement about our potential to contribute to a better understanding of nature and culture through our collections and research activities.

Jonathan Haas
Vice President,
Collections and Research

ANTHROPOLOGY

DEPARTMENT OF ANTHROPOLOGY

BENNET BRONSON (Ph.D. 1976, Pennsylvania). Chairman and Curator, Asian Archaeology and Ethnology. Joined Field Museum in 1971.

CURRENT RESEARCH:
Dr. Bronson continued to focus on his National Geographic Society funded Southern Thailand project, carried out in collaboration with Dr. Ho Chuimei, Field Museum Research Associate, and with the Archaeology Division of the Fine Arts Department of Thailand. In February and March of 1990, the project team performed extensive analysis of the finds made in 1989 at the 9th century port sites of Ko Kho Khao and Laem Pho. It also carried out a field survey in southern Thailand, looking for related sites. 48 known and recently discovered sites were visited and surface-collected. Only three proved to be contemporary with the two sites under investigation. Analysis and writing up of finds is now well advanced. A final report should be finished on schedule in June 1991.

Dr. Bronson is also engaged in several minor research projects. Two involve Museum collections: a study of Chinese ritual bronzes of the Ming and Qing periods, collaborating with Dr. Ho Chuimei; and a chemical study of early Middle Eastern glass by advanced spectroscopic methods, in collaboration with Dr. Joseph Lambert of Northwestern University. A third project centers on re-evaluating the importance of bronze in the prehistoric period in Southeast Asia. All of these projects will result in publications.

TEACHING:
1 student intern (graduate) from the University of Illinois, Chicago.

GLEN COLE (Ph.D. 1961,University of Chicago) Curator, Prehistory. Joined Field Museum in 1965.

CURRENT RESEARCH:
Dr. Cole's current research is concerned with a congeries of stone industries in central and eastern Africa collectively known as "Sangoan." The Sangoan concept is ill-defined, in large part because the artifactual material on which it is based, from the Sango and Kanabulem Hills in southwestern Uganda, had never been adequately described. In April of 1989, Dr. Cole visited the Cambridge University Museum to complete his study of their collection from this area and has added the new data to those earlier gathered both from this collection and from the type collection studied many years ago in Uganda. A paper prepared before study of the Cambridge Museum collection had been completed has now been revised and considerably expanded. Preparation of illustrations of artifacts is now nearly complete and it is

expected that the paper will be ready to submit to *The African Archaeological Review* by the end of January, 1991.

TEACHING:
1 student intern (undergraduate) from the University of Illinois, Urbana.

WINIFRED CREAMER (Ph.D. 1983, Tulane) Visiting Assistant Curator, Northern Rio Grande Research Project. Joined Field Museum in 1989.

CURRENT RESEARCH:
Dr. Creamer was co-director of the Northern Rio Grande Research Project archaeological field work in New Mexico. From June-August 1990 some thirty roomblocks at San Marcos Pueblo, located south of Santa Fe, NM, were sampled to judge the date of terminal occupation. San Marcos, a ruin with over 2000 rooms, was occupied by Tanoan-speaking Pueblo people from the 1300s to the time of the Pueblo Revolt in 1680. Fieldwork in the summer of 1990 consisted of excavating samples of rooms in each of over 30 roomblocks to determine the period of occupation and abandonment of different parts of the site. The research revealed that although San Marcos appears very large on the surface, there were probably never more than one-quarter of the rooms occupied at any given time. Instead of one large occupation with several thousand people living at the site for 300 years, the site appears to have been occupied sequentially by a few hundred people living in different parts of the site for 25 to 50 years apiece. This research has significant implications for interpreting the demography of northern New Mexico in the centuries immediately before and following the arrival of the first Europeans in the 16th century. She also supervised analysis of the ceramics and ground stone artifacts from the site during the fall.

Dr. Creamer and Dr. Haas also submitted *Warfare and Tribalization in the Prehistoric Southwest*, the results of their 1984-1988 research in the Kayenta region of Arizona, to *Fieldiana* for publication.

OTHER APPOINTMENTS:
Assistant Professor, Department of Anthropology, Northern Illinois University, DeKalb

TEACHING:
North American Indians (8/27/90-12/14/91, NIU)
General Prehistoric Archaeology (8/27/90-12-14-90, NIU)
3 student interns (undergraduate, 5/1-5/30/90, Denison University)

JONATHAN HAAS (Ph.D. 1979, Columbia) Curator, New World Archaeology. Joined Field Museum in 1989.

CURRENT RESEARCH:
Although most of his time is devoted to administration in the office of Collections and Research, Haas worked on two main projects within anthropology: repatriation and the Northern Rio Grande Research Project. In the area of repatriation, he consulted extensively with leaders of the Native American community and the American Association of Museums in the development of national repatriation legislation. On the local level, he met with representatives of the Blackfeet, Blood, Cheyenne and Hopi tribes to discuss the propriety of existing exhibits and the treatment and care of related collections. Working with Winifred Creamer, Haas also administered a six week field season in northern New Mexico concentrating on the pueblo of San Marcos.

ADJUNCT APPOINTMENTS:
External Faculty, Santa Fe Institute.
Research Associate, University of Chicago, Department of Anthropology.

PHILLIP LEWIS (Ph.D. 1966, University of Chicago) Curator, Primitive Art and Melanesian Ethnology. Joined Field Museum in 1952.

CURRENT RESEARCH:
Dr. Lewis continued to research and write about a central concern stemming from his work in New Ireland, namely, the functioning of a system of art in a milieu of social change in New Ireland. His writing about the changes in village settlement patterns from 1953 - 1981 continued, and Dr. Lewis keeps returning to themes of continuity and change in the art of New Ireland. In the last few years, Dr. Lewis has presented at anthropological meetings papers on Style in New Ireland Art, and Diachronic Views of certain Malanggan designs, both ideas not much dealt with in the study of New Ireland art. He is attempting to explain what makes it possible for certain Malanggan designs to persist through time in recognizable form, while at the same time certain of those designs vary across space, by displaying local styles. These ideas are being developed in papers dealing with style of art as it varies according to provenience.

In addition to his research work, Dr. Lewis spent approximately 200 hours providing assistance to the Pacific Exhibit staff from Public Programs.

CHARLES STANISH (Ph.D. 1985, University of Chicago) Assistant Curator, Middle and South American Archaeology and Ethnology. Joined Field Museum in 1987.

CURRENT RESEARCH:
Dr. Stanish's speciality is the archaeology of the South Central Andes, an area that encompasses southern Peru, Bolivia, and northern Chile. His specific research interests include the evolution of complex societies in the Andes, one of the great nuclear centers of civilization in the world. After several years of research in the coastal valley of Moquegua, he has begun a new long term research program in the Titicaca Basin of southern Peru. Grants from the National Science Foundation and the H. John Heinz III Charitable Trust provide funding for this research. In the last three years, Dr. Stanish and his team have discovered 500 archaeological sites and excavated a number of them that range in date from 1300 B.C. to the Spanish Conquest along the shores of Lake Titicaca, the world's highest navigable lake.

ADJUNCT APPOINTMENTS:
Adjunct Professor, University of Illinois at Chicago, Department of Anthropology.
Research Associate, University of Chicago.

TEACHING:
New World Political Economy (University of Illinois at Chicago)
Seminar in Andean Prehistory (University of Illinois at Chicago)

JOHN TERRELL (Ph.D. 1976, Harvard) Curator, Oceanic Archaeology and Ethnology. Joined Field Museum in 1971.

CURRENT RESEARCH:
Dr. Terrell, with Visiting Associate Curator Robert Welsch, completed work under a National Science Foundation grant on the Field Museum's A. B. Lewis collection of material culture (and its associated field documentation) from New Guinea. The chief objective of this grant project was to develop a reliable, quantified database of information on the items in this collection from the North Coast of New Guinea.

Using this database of information, Drs. Terrell and Welsch are investigating the degree to which observed similarities and differences among the ethnographic village "site assemblages" in the A. B. Lewis collection co-vary with known ethnic diversity on the North Coast (as shown by language and language-group affiliation).

During March - May 1990, Drs. Terrell and Welsch travelled on the 1990 Walgreen Expedition to Papua New Guinea to investigate research possibilities on the North Coast in the Aitape district. They were astonished with the degree of continuity between 1909 (when Lewis first visited the coast) and 1990 in material culture and economic relations.

ADJUNCT APPOINTMENTS:
Adjunct Professor, Department of Anthropology, Northwestern University.

TEACHING:
Complex Societies (Northwestern University and University of Illinois at Chicago joint course for undergraduates/graduates)
1 student intern (graduate) from Northwestern University.

JAMES W. VANSTONE (Ph.D. 1954, Pennsylvania) Curator, North American Archaeology and Ethnology. Joined Field Museum in 1966.

CURRENT RESEARCH:
Work continued on the preparation of a final report on archaeological excavations at an historic Yupik Eskimo site on the Alaska penisula in 1985. This study is being carried out in cooperation with Dr. Don E. Dumond, University of Oregon. Dr. VanStone's work also continued on projects related to the traditional ethnography of Inupiat Eskimos of the Kotzebue sound region, Alaska based on historical research and fieldwork undertaken with Charles V. Lucier (retired) in 1949-52. A paper on the use of the traditional oil lamp among Kotzebue Sound Inupiat has been accepted for publication in *Arctic Anthropology*. Papers on historic pottery and traditional seal hunting techniques in the area will be completed in 1990. Dr. VanStone's study of Inupiat Eskimo material culture based on collections in the Folken Museum Etnografiska, Stockholm were published in *Fieldiana: Anthropology*. His study of Plains Cree material was also completed in 1990.

Dr. VanStone, and Technical Assistant Loran Recchia, served as developers for a temporary exhibit "From Old to New: Crafts of Alaska's Indians." The exhibit will be on display from September 1990 - February 1991.

ROBERT L. WELSCH (Ph.D. 1982, University of Washington) Visiting Associate Curator, A. B. Lewis Research Project. Joined Field Museum in 1984.

CURRENT RESEARCH:
Dr. Welsch supervised a complete inventory (including archival photographs) of Field Museum's North Coast collection from Papua New Guinea. He also continued his analysis of the diversity of material culture in this collection and is editing the A. B. Lewis diaries for future publication. Dr. Welsch and Curator John Terrell travelled on the 1990 Walgreen Expedition to Papua New Guinea to investigate research possibilities on the North Coast in the Aitape district.

ADJUNCT APPOINTMENTS:
Research Associate, Department of Anthropology, Northwestern University.

TEACHING:
Independent Study (Northwestern University)
4 student interns (2 undergraduate, 2 graduate) from Northwestern University.
1 student intern (graduate) from University of Delaware.

BOTANY

DEPARTMENT OF BOTANY

JOHN J. ENGEL (Ph.D. 1972, Michigan State University) Chairman and Curator, Bryology. Joined Field Museum in 1972.

CURRENT RESEARCH:
John Engel has an established bryological research program in south temperate and subantarctic areas of the world. Within that framework Engel is engaged in both monographic and floristic studies on temperate Australasian hepatics. Engel is collaborating with Field Museum Research Associate Rudolf Schuster on the Hepatic *Flora of New Zealand* project. In addition Engel is engaged in monographic studies on the family Geocalycaceae and is concentrating his efforts on *Chiloscyphus*. That genus is large, complex and particularly diverse in south temperate and subantarctic regions. Engel also publishes *Index Hepaticarum Supplementum* series, each supplement covering a two year period. For each two year period all new taxa and combinations of liverworts and hornworts are indexed. The project is an ongoing one for the International Association of Bryologists. Engel has been instrumental in acquiring for Field Museum the extremely important R. M. Schuster bryological herbarium and is managing its transfer and curation.

WILLIAM C. BURGER (Ph.D. 1961, Washington University) Curator, Vascular Plants. Joined Field Museum in 1965.

CURRENT RESEARCH:
William Burger is currently revising the coffee family (Rubiaceae) for the Flora Costaricensis series. With approximately 400 species in Costa Rica, this family is an important and distinctive component of forest formations throughout the country. Keys and descriptions have been prepared for all but a few genera, and the first 20 comparative illustrations have been completed. This work, done in collaboration with Charlotte Taylor of the Missouri Botanical Garden, will require another year to complete. Plant distribution patterns are often very sharply defined by altitude on Costa Rica's evergreen mountainsides. These altitudinal patterns occur in widely separate families and sometimes separate very closely related species. A review of these patterns has led to the hypothesis that phytopathology is a critical factor in delimiting species' altitudinal range. It is also suggested that phytopathology may play an important role in plant speciation in the wet tropics.

ADJUNCT APPOINTMENTS:
Lecturer, Committee for Evolutionary Biology, University of Chicago.

MICHAEL O. DILLON (Ph.D. 1976, University of Texas) Associate Curator, Vascular Plants. Joined Field Museum in 1978.

CURRENT RESEARCH:
Michael Dillon continues his research program encompassing botanical inventories in threatened habitats in South America and the taxonomy and evolution of Neotropical Asteraceae. Botanical inventories of both the *lomas* formations of coastal western South America and *Bosque Monteseco*, a relict forest in northern Peru, have both been recently completed and are being prepared for publication. These projects have yielded many species new to science which are being described and their systematic positions established. A floristic treatment of the tribe Inuleae (Asteraceae) will be published in the *Flora of Peru*, Fieldiana Botany series early next year, and a cladistic and phenetic analysis of the group within all of South America will follow. A project to construct a computerized database of the 1500 members of the family Asteraceae for Peru is underway and it will be useful in monographic and floristic research. A 6-week field trip to Peru during October-November yielded new species and records from northern Peru and provided an opportunity for lectures and short courses given at the Museo de Historia Natural in Lima, the Universidad Nacional in Cajamarca and the Universidad Antenor Orrego in Trujillo. At a ceremony on 30 October 1990, the Universidad Nacional de Cajamarca bestowed the title of Honorary Professor in the Education Faculty on Dr. Dillon in recognition of his efforts for improving the botanical program of that university.

THOMAS G. LAMMERS (Ph.D. 1988, Ohio State University) Assistant Curator, Vascular Plants. Joined Field Museum in 1990.

CURRENT RESEARCH:
Thomas Lammers' research deals with the systematics of the Campanulaceae, especially subfamily Lobelioideae. Current aspects of this include: (1) preparation of a treatment of Campanulaceae for the new *Flora de Chile*; (2) preparation of revisions of the six genera endemic to the Hawaiian Islands; (3) studies of evolutionary patterns and processes among the Hawaiian endemics; (4) determination of chromosome numbers and patterns of cytological evolution among the Lobelioideae; (5) studies of the taxonomy and evolution of the *Wahlenbergia fernandeziana* complex.

GREGORY M. MUELLER (Ph.D. 1982, University of Tennessee) Assistant Curator, Mycology. Joined Field Museum in 1985.

CURRENT RESEARCH:
Gregory Mueller's research program consists of two interrelated projects aimed at increasing our understanding of the systematics, distribution and evolution of higher fungi, especiallly members of the Agaricales that form ectomycorrhizae. These projects include monographic studies on the genus *Laccaria* and a mycological

survey of Costa Rican oak forest fungi. Both of these programs contain major collecting and laboratory components. Work is continuing on the New World taxa of the mushroom genus *Laccaria*. A number of articles covering segments of this work have been published and a book length monograph on the genus for North America north of Mexico is almost complete with submission date set for late 1990 or very early 1991. Collecting for the South American treatment of the group is now complete and the numerous specimens obtained are being examined. The MacArthur Foundation is currently funding a 3-year study of the higher fungi of Costa Rican oak forests. Some results of this work were presented in an invited symposium address to the 4th International Mycological Congress, Regensburg, Germany.

TEACHING:
Participated in a team taught course on Research at Field Museum for the University of Chicago.

ROBERT G. STOLZE (B.S. 1949, Notre Dame) Associate Curator, Pteridophytes. Joined Field Museum in 1963.

CURRENT RESEARCH:
Robert Stolze is involved in a 6-year project, "Pteridophyta of Peru", being authored in collaboration with Professor Rolla M. Tryon, of Harvard University and the University of South Florida. This floristic study is being published in *Fieldiana* in six parts, two of which are already published. Approximately 100 genera and 1,000 species of ferns and fern allies will be treated, and a comprehensive index will be appended to each volume. Special sections will discuss speciation and biogeographic processes in the Andes based on the floristic work. This is the first modern pteridophyte flora for an Andean region and provides a source of fundamental information for botanists, zoologists, ecologists and biogeographers.

GEOLOGY

DEPARTMENT OF GEOLOGY

JOHN R. BOLT (Ph.D. 1968, University of Chicago), 1989 and 1990 Chairman and Curator, Fossil Reptiles and Amphibians. Joined Field Museum in 1972.

CURRENT RESEARCH:
John Bolt's current studies include: i) relationships and morphology of primitive amphibians (as well as fish) from a new Mississippian-age (ca.335 million years before present) locality in southeastern Iowa. The locality has produced hundreds of specimens of the oldest tetrapods known from continental North America. Specimen preparation has been going on for some time, but complete preparation will require several more years. ii) Fossil evidence for the origin and early evolution of the tetrapod hearing system and its implications for the evolution of that system as well as for tetrapod relationships. iii) origin and the early evolution of the living amphibians (lissamphibians).

ADJUNCT APPOINTMENTS:
Adjunct Associate Professor, Geological Sciences, University of Illinois at Chicago
Member, Committee on Evolutionary Biology, University of Chicago.

TEACHING:
Origin and Diversification of Tetrapods, University of Chicago.

PETER R. CRANE (Ph.D. 1981, University of Reading, U.K.) 1991 Chairman and Curator, Paleobotany. Joined Field Museum in 1982.

CURRENT RESEARCH:
Recent work has addressed four questions: To which living or fossil seed plants are angiosperms most closely related? What are the closest living relatives of early fossil angiosperms? What was the timing and pattern of the early angiosperm diversification? What vegetational and other biotic changes occurred in association with the angiosperm diversification between about 130 and 65 myr B.P.? Current field work in eastern North America, central Portugal and Ecuador has recovered well-preserved microscopic flowers of early angiosperms and related plants from the mid-Cretaceous (about 100 myr B.P.) Scanning electron microscopy of this material is providing important morphological and systematic data, as well as insights into pollination and other aspects of reproductive biology in early angiosperms. Studies of pollen grains preserved in situ within flowers also provide a more secure basis for ecological interpretations of the fossil palynological record. Ultimately, these studies and associated syntheses

of Cretaceous palynological data currently underway at the Field Museum are designed to improve current understanding of the large-scale biotic and environmental changes that occurred during the critical mid-Cretaceous phase of Earth history.

ADJUNCT APPOINTMENTS:
Member, Committee on Evolutionary Biology, University of Chicago
Research Associate (Professor), Geophysical Sciences, University of Chicago
Adjunct Professor, Botany, University of Massachusetts.

TEACHING:
Animal and Plant Diversity, University of Chicago.

JOHN FLYNN (Ph.D. 1983, Columbia University), Associate Curator, Fossil Mammals. Joined Field Museum in 1988.

CURRENT RESEARCH:
John Flynn continues integrating a wide variety of geologic techniques (including paleomagnetic analyses performed in the new Field Museum Paleomagnetics Laboratory) in studies of geologic time, plate tectonics, and mammalian evolution. In South America, Flynn is completing a study (funded by the National Science Foundation) of the geochronology of strata containing 10-20 million year old mammalian faunas (Columbia and Chile); completing a project (Eppley Foundation) on a new 15-20 million year old terrestrial mammal and marine fauna from Chile, in which it is possible to constrain the timing and rate of uplift of the southern Andes Mountains: Exciting reconnaisance discovery (National Science Foundation, National Geographic Society) of a new 30 million year old mammal fauna from the high Andes of central Chile, on the flanks of Volcan Tinguiririca, representing a new Land Mammal Age partly filling a previous gap of 15 million years in our knowledge of the South American fossil mammal fauna; and reconnaisance work (National Geographic) collecting fossil pinnipeds (seals & sea lions) and birds from 10-15 million year old marine deposits of coastal northern Chile. Flynn also continues to pursue his interest in carnivore evolution and phylogeny. He completed a chapter on early fossil Carnivora for a book to be published by Cambridge University Press, and he presented a paper (to be published in a symposium volume in 1991 by Columbia University Press) on carnivore evolution for a June 1990 international symposium sponsored by the Sloan-Kettering Foundation and American Museum.

ADJUNCT APPOINTMENTS:
Member, Committee on Evolutionary Biology, University of Chicago; Lecturer, Biological Sciences, Collegiate Division, University of Chicago; Faculty Participant, Geophysical Sciences, Paleontology & Stratigraphy Program, University of Chicago;
Research Associate, American Museum of Natural History;
Adjunct Faculty, Rutgers University.

TEACHING:
Plant and Animal Natural History, University of Chicago; Mammalian Evolution, University of Chicago.

LANCE GRANDE (Ph.D. 1983, City University of New York/American Museum of Natural History) Associate Curator, Fossil Fishes. Joined Field Museum in 1983.

CURRENT RESEARCH:
Lance Grande's current research focuses on the origin and early evolution of actinopterygian (ray-finned) fishes, a group containing nearly half of all vertebrate animals. He uses an interdisciplinary approach involving detailed analysis of both fossil and living species, examinination of the comparative anatomy, ontogeny (development), geographic distribution and geologic age. The most general aspects of his work are aimed toward demonstrating that the earth's surface and it's biota evolved together and therefore produced repeating patterns that we can find in nature (e.g. all Early Eocene [50 million-year-old] freshwater teleosts of western North America seem to have their closest transoceanic relatives in East Asia). Also, he uses detailed studies of fish anatomy and ontogeny to compare patterns of development with patterns of evolution. More specifically, Lance just finished a 2 and 1/2 year study of the primitive actinopterygian group Acipenseriformes (sturgeon and paddlefishes) with Willy Bemis from the University of Massachusetts. This NSF funded study resulted in a large monograph to be published in early 1991. He and Willy now plan to move on to another primitive group, amiiiform fishes, which include one Recent species and about 100 fossil species. Lance also is continuing his projects of fossil fishes from Antarctica and Mexico. Lance was also an invited speaker for two special symposia this year: One on "Early Tertiary Paleontology and Environments of Wyoming" at the Geological Society of America meeting in Jackson, Wyoming, and one on "The Use of Fossils in Phylogenetic Reconstruction" at the Society of Vertebrate Paleontology meeting in Lawrence, Kansas.

ADJUNCT APPOINTMENTS:

Research Associate, Department of Vertebrate Paleontology, American Museum of Natural History;
Member, Committee on Evolutionary Biology, University of Chicago;
Lecturer, University of Illinois at Chicago.

TEACHING:

Systematic Ichthyology, University of Chicago; Research at Field Museum, Evolutionary Biology, CEB388, University of Chicago.

SCOTT LIDGARD (Ph.D. 1984, Johns Hopkins University) Associate Curator, Paleoecology and Invertebrate Paleontology. Joined Field Museum in 1984.

CURRENT RESEARCH:

Lidgard's research focuses on the roles of different modes of growth in large scale patterns of cheilostome bryozoan evolution, environmental distribution, and ecology. He has attempted to synthesize the overriding evolutionary trends in predominant modes of growth in this group, documenting a persistent evolutionary transition in which one mode of growth is gradually supplanted by another during the past 100 million years. Placed in an environmental context, this work has also provided a novel test of paleoenvironmental studies of other groups of marine benthos in which onshore origin was followed by expansion into offshore, deeper water marine environments. A related research problem involved re-evaluating the dominance through time of the three major groups of cheilostome bryozoans --- anascans, cribrimorphs, and ascophorans. Increasing calcification of zooids during the successive evolutionary rises of these groups has previously been linked to increasing predation pressure. However, comparisons with bryozoan colony forms suggest that past adaptive interpretations under-appreciated the diversification of taxa with moundlike or erect growth habits, many of which are characterized by ascophoran frontal walls. Collaborative research with Peter Crane examines large scale floristic patterns surrounding the radiation of angiosperms. In recent studies they have employed trend surface analyses to demonstrate a striking latitudinal shift (from tropical to boreal) in the pattern of increasing angiosperm dominance through the Cretaceous. Most recently, Drs. Lidgard and Crane have attempted to clarify the rate and magnitude of angiosperm radiation using the unique parallel fossil records of leaves and pollen/spores, thus using two independent life history stages to provide a deductive test of evolutionary tempo during the diversification of a major group of organisms.

ADJUNCT APPOINTMENT:

Lecturer, Committee on Evolutionary Biology, University of Chicago.

MATTHEW H. NITECKI (Ph.D. 1968 University of Chicago) Curator, Fossil Invertebrates. Joined Field Museum in 1965.

Nitecki's research concentrates on two areas: (1) Problems in the analysis of the cyclocrinitid morphology, which is a part of the long-term project on the evolution, morphology, and systematics of problematic lower Paleozoic cyclocrinitid algae; and (2) the nature of receptaculitids from Sweden and the Baltic provinces of the USSR, which is also part of a long-term study of the paleobiology of receptaculitid problematic fossils.

In addition, Nitecki is responsible for the Spring Systematic Symposium, now in its 14th year. The series supports two major functions of museums: The discovery of new and important theoretical knowledge and the dissemination of this knowledge to the scientific community. Continuing support from the National Science Foundation testifies to the success of the symposia. The 1990 Symposium was concerned with the understanding and meaning of ethical judgement and the relation between ethics and evolution. It was sponsored by the Society for the Study of Evolution. Nitecki has also served as editor of the Palaeontological Journal since 1988.

ADJUNCT APPOINTMENTS:
Member, Committee on Evolutionary Biology, University of Chicago; Lecturer, The College, University of Chicago.

TEACHING:
Introduction to Evolutionary Biology, University of Chicago.

ED OLSEN (Ph.D. 1959, University of Chicago) Curator, Mineralogy. Joined Field Museum in 1960.

Olsen is currently using an analytical-scanning-electron-microscope and an electron probe microanalyzer in a search for phosphate and silicate phases in iron meteorites to measure their Mn/Cr ratios. Those phases with high ratios are suitable candidates for ion-microprobe work to measure excesses of the isotope, Cr-53. This serves as an atomic clock to measure the time scale of core formation in planets. The ion-microprobe work is being done both at the University of Chicago and at California Institute of Technology. In addition, he has begun to look for phosphate phases in stone-iron meteorites with high Nd, in the hope of obtaining radiometric dates for planetary core-mantle formation by the Nd-Sm clock.

ADJUNCT APPOINTMENTS:
Adjunct Professor, Geological Sciences, University of Illinois at Chicago; Research Associate/Professor, Geophysical Sciences, University of Chicago.

OLIVIER RIEPPEL (Ph.D. 1978, University of Basle) Curator, Fossil Reptiles and Amphibians. Joined Field Museum in 1990.

Current research is focused on the pattern of skeleton formation in representatives of all major extant reptile groups. A better understanding of the sequence of ossifications in the reptile skeleton will contribute to the assessment of the interrelationships of mesozoic marine reptiles (Sauropterygia). Probably in correlation with their aquatic habits, these fossils show reduced ossification of their skeleton, resulting in the loss of many characteristics which would be of importance in a cladistic analysis. The study of ontogeny seems to be the most promising approach to fill this gap of knowledge.

The study of a species complex of Mid-Triassic fishes (genus Saurichthys) might provide important insights in the evolution of new species from a paleontological perspective if it were possible to distinguish ontogenetic variation (difference of characters due to individual age and size) from taxonomic differentiation (difference of characters due to speciation). One of the key characters to distinguish the fossil fishes in question, is the structure of the unpaired fins. The study of the development and variability of unpaired fins in extant fishes is the object of a joint project with Dr. Barry Chernoff, Zoology (Fishes).

ZOOLOGY

DEPARTMENT OF ZOOLOGY

RUDIGER BIELER (Ph.D., '85, University of Hamburg), Assistant Curator, Invertebrates. Joined Field Museum in 1990.

CURRENT RESEARCH:
Bieler continues research on the evolution, comparative anatomy, zoogeography and reproductive biology of marine gastropods and bivalves. He employs a variety of field and laboratory methods, ranging from collecting by scuba diving to electron microscopy, histology, electrophoresis and various computer-assisted techniques. Current fieldwork concentrates on the subtropical western Atlantic. His recent publications include a critique of the methodology currently used by European researchers to reconstruct phylogeny in the Mollusca. This work stimulated ongoing public discussion in the field of malacology. Other publications dealt with the reproductive biology of mollusks in unusual habitats (sessile marine snails, clams living as commensals in shrimp burrows), and included the first ultrastructural study of the somatic characters of a bivalve gonad. Major new projects include the study of deep water snails (collected for this project by manned submersibles in Florida and the Caribbean). These worm-like snails live embedded in deep water sponges and living specimens of this group had never before been seen.

ADJUNCT APPOINTMENTS:
Adjunct Assistant Professor, Graduate College of Marine Studies, University of Delaware, Lewes, Delaware.

BARRY CHERNOFF (Ph.D., 1983, University of Michigan), Associate Curator. Joined Field Museum in 1987.

CURRENT RESEARCH:
Barry Chernoff's research includes studies of silverside fishes, family Atherinidae, and tetras from freshwaters of South America, order Characiformes. This portion of his research program emphasizes the phylogenetic relationships, historical biogeography, morphological differentiation in relation to environmental gradients, and species boundaries. These studies are important because they are altering our view of the systematic structure of major groups of fishes, and also modifying our thoughts about historical patterns of evolution in the New World. Furthermore, these studies contribute to conservation efforts associated with saving the aquatic resources of Central and South America. Much of the data from the silverside and tetra research fits into the second phase of

Chernoff's studies on the theory and methodology of morphological evolution. He is completing his studies on mathematical relationships between the molecular clock and the geometry of evolutionary trees. He continues to implement studies on the phylogenetic implications of developmental factors and ontogenetic covariance. In collaboration with other colleagues he is completing a study on the concept of species.

ADJUNCT APPOINTMENTS:
Member, Committee on Evolutionary Biology, University of Chicago

TEACHING:
Systematic Biology, University of Chicago
Advanced Studies in Quantitative Morphology, University of Chicago
Morfología Evolutiva, Universidad Central de Venezuela

LAWRENCE R. HEANEY (Ph.D.'79, University of Kansas), Assistant Curator, Mammals. Joined Field Museum in 1988.

CURRENT RESEARCH:
Lawrence Heaney's current research centers on patterns of mammalian diversity, with a special interest in island ecosystems (including their conservation). His long-term studies on the origin, evolution and ecology of mammals in Southeast Asia are continuing, with specific studies resulting in five papers in press on the topics of patterns of diversity along elevational gradients, the ecological and evolutionary dynamics of distributional patterns of fruit bats, a review of climatic change in Southeast Asian during Pleistocene and Recent times, a faunal inventory of a previously unknown island, and description of a highly distinctive new burrowing rodent. Projects nearing completion include the first biochemically-based studies of genetic diversification of Philippine mammals, analysis of extinction patterns under natural and human-induced conditions, and diversification in Philippine insectivores. These studies are carried out in collaboration with the Philippine National Museum, Philippine Parks and Wildlife Bureau, and two Philippine universities. During 1990, Heaney presented results of these studies at two national and two international conferences, and was invited to serve as a consultant for a new program in conservation of biological diversity based at the National University of Mexico in Mexico City.

ADJUNCT APPOINTMENTS:
Member, Committee on Evolutionary Biology, University of Chicago
Research Associate, Smithsonian Institution

TEACHING:
University of Chicago - "Biogeography," Spring 1990 (team taught with B. D. Patterson)
University of Chicago - "Research at the Field Museum," Fall 1990 (speaker, series organized by B. D. Patterson)

ROBERT F. INGER (Ph.D. '54, Chicago) Curator, Amphibians & Reptiles. Joined Field Museum in 1946.

CURRENT RESEARCH:
Inger's research is centered on the systematics and evolution of communities of amphibians and reptiles in Bornean forests, a long-range program involving field and laboratory work. Although a primary goal has been the analysis of variation of these communities in primary rain forest, work has been expanded to investigate the effects of selective logging. The expansion not only will help in understanding processes affecting variation in the communities of pristine forests, but also contribute to the growing science of conservation biology. The ecological aspects of this work are a joint effort with Harold Voris.

ADJUNCT APPOINTMENTS:
Member, Committee on Evolutionary Biology, University of Chicago.
Honorary Curator of Reptiles, Sarawak Museum.

JOHN KETHLEY, (Ph.D.'69, University of Georgia), Associate Curator, Insects. Joined Field Museum in 1970.

CURRENT RESEARCH:
John Kethley's current research involves the systematics and ecology of deep soil mites, especially early derivative taxa. A completely new procedure for collecting all developmental stages of these microarthropods was demonstrated at the International Workshop on Modern Techniques in Soil Ecology. His systematic research has resulted in the description of a new family of primitive soil mites from Gary, Indiana, and a new taxon based on a Devonian age mite fossil. His synthesis of the systematics and ecology of prostigmatid soil mites is due to be published early in 1991.

ADJUNCT APPOINTMENTS:
Lecturer, Ohio State University
Member, Committee on Evolutionary Biology, The University of Chicago

TEACHING:
Systematics and phylogeny of prostigmatid mites in Soil Acarology, Medical and Veterinary Acarology, and Agricultural Acarology, Summer Institute of Acarology, Ohio State University.

SCOTT LANYON (Ph.D.'85, Louisiana State University) Associate Curator, Birds Joined Field Museum in 1985.

CURRENT RESEARCH:
Scott Lanyon continues to concentrate his research efforts on the elucidation of phylogenetic relationships within the New World Blackbirds (Icterinae). Within this assemblage of some 97 species it is possible to find examples of virtually every behavior pattern known to occur within song birds: monogamy, polygyny, promiscuity, delayed maturation, sexual size dimorphism, sexual dichromatism, brood parasitism, vocal mimicry, territoriality, coloniality, extensive geographic variation, etc. As interesting and as well studied as this group is, no phylogeny depicting the geneological relationships between the component species and genera has been proposed for the group. Lanyon has completed his first attempt at reconstruction on the phylogeny of this assemblage, using allozyme, DNA, and cranial characters. He is in the process of writing up these results. He will refine this estimate of evolutionary history with additional DNA sequence information and with a survey of additional species.

A second aspect of Lanyon's research program concerns the philosophy and methodology of phylogeny reconstruction. He has completed the development of computer algorithms for summarizing results from studies of independent sets of systematic characters and has submitted the manuscript. Lanyon is also working with Barry Chernoff and Steve Ashe on a manuscript concerning the nature of "species".

ADJUNCT APPOINTMENTS:
Member, Committee on Evolutionary Biology, University of Chicago.
Adjunct Professor, Illinois State University.

TEACHING:
Reading courses in systematics, The University of Chicago.

Major Professor for:
Hector Colon, University of Chicago: Reproductive altruism in the Tody (Aves, Coraciiformes).

Thomas Schulenberg, University of Chicago: Phylogeny and adaptive radiation of the Vanga Shrikes of Madagascar.

John Harshman, University of Chicago: topic undetermined.

ALFRED F. NEWTON, Jr. (Ph.D.'73, Harvard), Assistant Curator, Insects. Joined Field Museum in 1985.

CURRENT RESEARCH:
Newton's current research revolves around studies on the evolution of the large beetle family Staphylinidae (over 45,000 named species). He continues a long-term study of the higher-level classification and evolution of the group by focusing on reconstructing the phylogeny of one of the family's four main lineages, and is currently analyzing over 70 characters in the ten higher taxa of this lineage. With the aid of a 3-year NSF grant awarded this year, he has also begun a systematic revision of the 160+ New World species of the genus *Platydracus*, whose species promise to be of special interest for understanding the origin of current distribution patterns of forest-dwelling insects in the Neotropics. A recent two-month trip to study types and other specimens at eight European museums has greatly advanced both projects. Study of collections during this trip also aided another long-term project, improving knowledge of the staphylinoid fauna of Australia and other southern temperate areas with the ultimate aim of using this group to help understand the origin of southern disjunct distribution patterns that are very common within the group. Newton has also completed a study of beetles associated with slime molds in India (with mycologist S. L. Stephenson), and a review of the present state of knowledge of larvae of staphylinoid beetles.

BRUCE D. PATTERSON (Ph.D.'81, New Mexico State) Associate Curator, Mammals. Joined Field Museum in 1981.

CURRENT RESEARCH:
Patterson continues his wide-ranging program of studies on the evolution, ecology and distribution of mammals, chiefly those in the New World tropics. This year marked the completion of one series of studies and the inception of their successors. He was an invited speaker at three symposia on conservation biology and one on temporal changes in ecological communities, presenting papers at two additional scientific meetings during the year. Also, during the year he wrote and submitted papers for publication on (1) the genetics and morphology of pocket gophers, (2) habitat associations of small mammals in Andean rainforests of Chile, (3) phylogenetic relationships of epauletted fruit bats (Sturnira), and (4) the temporal dynamics of nested subset patterns of distribution. In November

and December, he made his first expedition to the Atlantic Forest habitats of southeastern Brasil, designated one of the world's most pressing conservation priorities by the MacArthur Foundation, World Wildlife Fund, etc.

ADJUNCT APPOINTMENTS:
Member, Committee on Evolutionary Biology, University of Chicago
Adjunct Professor, Department of Biological Science, University of Illinois, Chicago.

TEACHING:
Division of Biological Sciences, University of Chicago & University of Illinois at Chicago; Rodent Diversity--independent readings; University of Chicago: BioSci 255, Biogeography.

JANET VOIGHT (Ph.D., 1990, University of Arizona), Assistant Curator of Invertebrates. Joined Field Museum in 1990.

CURRENT RESEARCH:
Voight continues her research to define and try to resolve evolutionary patterns in the Icirrate (finless) octopods. Morphometrics, a technique pioneered in the study of vertebrates, has proven extremely useful in offering new insight in incirrate octopod evolution. Current research tests whether these quantitative techniques are equally useful in the study of cirrate octopods, squids, and whether they are applicable to other soft-bodied invertebrate groups. Work on reconstructing phylogenetic relationships of incirrate octopods continues; the first complete set of hypothesized relationships of all genera in the suborder will result. New research on fossil cephalopods, in conjunction with Scott Lidgard, has begun; by pooling their expertise, they seek to increase their knowledge of paleozoic coleoid cephalopods and their diversity.

HAROLD K. VORIS, (Ph.D.'69, University of Chicago) Curator, Amphibians and Reptiles. Joined Field Museum in 1973.

CURRENT RESEARCH:
Harold Voris is currently pursuing three research topics, all based in Southeast Asia. In the lowland tropical rain forests of Borneo, he is studying the natural changes in communities of amphibians and reptiles that occur over time, and differences in these communities that occur from place to place. This year comparisons between logged forests and undisturbed forests are adding another dimension to the comparisons. In the Pulau Tiga marine park off the north coast of Borneo, Voris is studying the ecology of the banded sea krait, an amphibious sea snake. And in the Straits of

Johore between Malaysia and Singapore, a project on the mechanisms of colonization of the edible crab by barnacles was successfully completed and accepted for publication.

ADJUNCT APPOINTMENTS:
Member, Committee on Evolutionary Biology, University of Chicago.

COLLECTIONS AND RESEARCH

RESEARCH ASSOCIATES, FIELD ASSOCIATES, ASSOCIATES
1990

Department of Anthropology

Associates

Dorothy Baumgarten
Asian Material Culture

Louva Calhoun, B.F.A.
Anthropology

Sol Century
Asian Material Culture

Connie Crane, A.B.
North American Ethnology

Patricia Dodson, M.A.
Latin American Archaeology & Ethnology

Carolyn Moore, B.A.
Asian Material Culture

Col. Millard E. Rada, E.E.
Museology

Llois Stein
Oceanic Material Culture

Research Associates

Dean E. Arnold, Ph.D.
Mesoamerican & S. American Arch. and Ethnology

Eloise Richards Barter, M.A.
North American Ethnography

Robert J. Braidwood, Ph.D.
SW Asia and Old World Archaeology

James A. Brown, Ph.D.
North American Archaeology

Patrick H. Carmichael, Ph.D.
South American Archaeology and Ethnology

William J. Conklin, M.A.
Peruvian Architecture and Textiles

Phillip J. C. Dark, Ph.D.
African Ethnology

Jack L. Davis, Ph.D.
Mediterranean Archaeology

Richard De Puma, Ph.D.
Etruscan Archaeology

Fred R. Eggan, Ph.D.
North American and Philippine Social Anthro and Ethnology

Patricia S. Essenpreis, Ph.D.
North American Archaeology

Robert Feldman, Ph.D.
Andean Archaeology

Paul S. Goldstein, Ph.D.
South American Archaeology

Gray Graffam, M.A.
Andean Archaeology

Chuimei Ho, Ph.D.
East & SE Asian Archaeology & Art History

Bill Holm, M.F.A.
Northwest Coast Indian Art and Material Culture

F. Clark Howell, Ph.D.
Old World Prehistory

Maxine Kleindeinst, Ph.D.
Old World Prehistory

Alan L. Kolata, Ph.D.
Andean & Mesoamerican Archaeology & Ethnohistory

Lyle Konigsberg, Ph.D.
Physical Anthropology

Frederick W. Lange, Ph.D.
SW U.S. & Central American Arch. & Ethnohistory

Charles E. Lincoln, M.A.
Mayan Studies

Michael E. Moseley, Ph.D.
South American Archaeology

Charles R. Ortloff, M.Ae.E.
Peruvian Archaeology

Robert B. Pickering, Ph.D.
Human Osteology

George I. Quimby, M.A.
Museology and North American Culture History

David Reese, Ph.D.
Archaeozoology & Paleomalacology

Johan G. Reinhard, Ph.D.
Nepal, Bolivia, and Peru

Mario A. Rivera, Ph.D.
South American Archaeology

Amy Oakland Rodman, Ph.D.
Textiles

Robin Torrence, Ph.D.
Aegean & Pacific Archaeology & Ethnohistory

Ronald L. Weber, Ph.D.
Amazon Basin & NW Coast U.S. Arch. and Ethnology

Department of Botany

Associate

Betty Strack, M.S.
Mycology

Field Associates

Sandra Knapp, Ph.D.
Vascular Plants

(Field Associates continued)
David P. Lewis, M.S.
Chemistry

Marko Lewis
Bryology

Antonio Molina R., Ing. Agr.
Vascular Plants

Research Associates

Janis B. Alcorn, Ph.D.
Ethnobotany

Kerry A. Barringer,
Vascular Plants

Robert F. Betz, Ph.D.
Vascular Plants

William T. Crowe, Ph.D.
Archeobotany

Sylvia Feuer-Forster, Ph.D.
Palynology

Robin B. Foster, Ph.D.
Vascular Plants

Jesus Garcia J., Biol.
Mycology

Nancy Garwood, Ph.D.
Vascular Plants

Sidney F. Glassman, Ph.D.
Vascular Plants

Luis D. Gòmez, Ph.D.
Vascular Plants

Timothy J. Killeen, Ph.D.
Vascular Plants

Jorge Gomez-Laurito, B.S.
Vascular Plants

Rogers McVaugh, Ph.D.
Vascular Plants

Lorin I. Nevling, Jr., Ph.D.
Vascular Plants

Richard W. Pohl, Ph.D.
Vascular Plants

Patricio P. Ponce de Leon, Ph.D.
Mycology

Abundio Sagàstegui, Ph.D.
Vascular Plants,

Rudolf M. Schuster, Ph.D.
Bryology

Rolf Singer, Ph.D.
Mycology

D. Doel Soejarto, Ph.D.
Vascular Plants

Tod F. Stuessy, Ph.D.
Vascular Plants

Isidoro Sanchez V., Ph.D.
Vascular Plants

Pablo E. Sanchez Vindas, M.Sc.
Flora Costaricensis

Department of Geology

Associates

Doris Nitecki, M.A.
Paleontology

Field Associates

Thomas Guensburg, Ph.D.
Fossil Vertebrates

Research Associates

Edgar Allin, Ph.D.
Fossil Vertebrates

David Bardack, Ph.D.
Fossil Vertebrates

William Bemis
Lungfishes, lower verts., Amphibians

Frank Carpenter, Sc.D.
Fossil Invertebrates

Robert Clayton, Ph.D.
Geochemistry

Albert Dahlberg, Ph.D.
Fossil Vertebrates

Andrew Davis, Ph.D.
Geochemistry

Robert DeMar, Ph.D.
Fossil Vertebrates

Daniel Fisher, Ph.D.
Fossil Invertebrates

Gary Galbreath, Ph.D.
Fossil Vertebrates

Lawrence Grossman, Ph.D.
Meteoritics

Antoni Hoffman, Ph.D.
Fossil Invertebrates

James Hopson, Ph.D.
Fossil Vertebrates

David Jablonski, Ph.D.
Fossil Invertebrates

Michael LaBarbera, Ph.D.
Fossil Invertebrates

Ricardo Levi-Setti, Ph.D.
Fossil Invertebrates

Ernest Lundelius, Ph.D.
Fossil Vertebrates

Frank McKinney, Ph.D.
Fossil Invertebrates

Everette Olson, Ph.D.
Fossil Invertebrates

J. Michael Parrish, Ph.D.
Fossil Reptiles

David Raup, Ph.D.
Fossil Invertebrates

J. John Sepkoski, Ph.D.
Fossil Invertebrates

Paul Sereno, Ph.D.
Fossil Reptiles

Paul Sipiera, Ph.D.
Meteoritics

Joseph V. Smith, Ph.D.
Minerology

Leigh Van Valen, Ph.D.
Fossil Vertebrates

Department of Zoology

Associates

Barbara Brown, B.A.
Primates

John Clay Bruner, M.S
Fossil fishes

Sophie Ann Brunner
Preparation of skeletons

Edward C. Dickinson
Philippine birds

Ingrid Fauci
Maintenance of K.P. Schmidt Library

Dorothy Karall, B.A.
Illustration

Anthony Milewski, B.S.
Large mammal comparative ecology

Harry G. Nelson, M.Sc.
Systematics of dryopoid Coleoptera

Raymond Pawley, B.S.
Donations of specimens to herpetology collection

Field Associates

Fred Aslin
Geology, Biology

Jan Aslin
Geology, Biology

Barbara Becker, M.A.
Zoological research, mammal expeditions

Barbara L Clauson, M.S.
Specimen preparation; ornithological expedition

Susan Davis, M.S.
Neotropical birds

John F. Douglass, M.S.
Naturalist; expeditions

Teresa S. Greenfield, Ph.D.
Fieldwork, Fishes

Kiew Bong Heang, Ph.D.
Sea Snakes

Ghazally Ismail, Ph.D.
Sponsors research projects in Malaysia for FMNH

(Field Associates continued)
Ghazally Ismail, Ph.D.
Sponsors research projects in Malaysia for FMNH

Robert Izor, B.S
Carnivores of South America

Daryl R. Karns, Ph.D.
Herpetology and community ecology

Douglas Kelt, B.S.
Chilean mammals

Vince Kessner
Land Snails

Bong Heang Kiew, Ph.D.
Sponsors fieldwork on sea snakes in Malaysia

Thomas Lemke, Ph.D.
Phyllostomatid bats

David Matusik
Lepidoptera taxonomy

Edward Moll, Ph.D.
Biology of fresh water turtles

John Murphy, M.A.
Animal behavior and ecology

Laurie Price
Land Snails

Janice and William Street
Travel adventure book on an Iranian expedition

Walter Suter, Ph.D
Systematics of Scymaenidae (Coleoptera)

Research Associates

Peter L Ames, Ph.D.
Syringeal morphology of passerine birds

Warren Atyeo, Ph.D
Systematics of Acari

William J Beecher, Ph.D.
Jaw & limb adaptations among passerine birds

Angelo P. Capparella, Ph.D.
Neotropical birds

Donald S. Chandler, Ph.D
Systematics of Pselaphidae (Coleoptera)

Dale Clayton, Ph.D.
Host/parasite coevolution

David R. Cook, Ph.D
Systematics of Acari

Joel Cracraft, PH.D.
Avian systematics and evolutionary biology

Gustavo Cruz, M.S.
Marine and freshwater fishes of South America

Sharon Emerson, Ph.D.
Functional anatomy of anura

Jack Fooden, Ph.D.
Asian primates

Elizabeth-Louise Girardi, Ph.D.
Land Snails

David Greenfield, Ph.D.
Ecology of marine & freshwater fishes

Bruce C. Jayne, Ph.D.
Marine and estuarian snakes

William B. Jeffries, Ph.D.
Epifauna of sea snakes, crustaceans

Linda K Kinkel, Ph.D.
Ring-billed Gulls

R. Eric Lombard, Ph.D.
Functional anatomy of reptiles

Peter E Lowther, Ph.D.
Field Museum nest and egg collection

Patricia McGill-Harelstad, Ph.D.
Behavior and ecology of Herring Gulls

Peter Meserve, Ph.D
Population ecology of small mammals

Debra K Moskovits, Ph.D.
Rainforest tortoises

W. Wayne Moss, Ph.D
Systematics and phylogeny of bird skin parasites

Charles Nadler, M.D.
Species of the squirrel family: Sciuridae

Roy A. Norton, Ph.D
Systematics of Acari

Charles Oxnard, Ph.D.
Vertebrate anatomy

Philip D Perkins, Ph.D
Aquatic Coleoptera

Ronald Pine, Ph.D.
Taxonomy of South American mammals

Stephen Pruett-Jones, Ph.D.
Behavior and ecology of Birds of Paradise

George B. Rabb, Ph.D.
Taxonomy of salamanders: phylogeny of snakes

Charles Reed, Ph.D.
Morphology and evolution of mammals

Eric Allen Rickart, Ph.D.
Biogeography of mammals in Southeast Asia

Scott K. Robinson, Ph.D.
Evolutionary ecology within the Icterinae

H. Bradley Shaffer, Ph.D.
Phylogeny of salamanders

Jennifer M. Shopland
Birds, ecology of mixed species bird-flocks in the Neotropics

Petra Sierwald, Ph.D.
Systematics, morphology and evolution of spiders (Arachnida: Araneae)

Ronald Singer, D.Sc.
Mammalian anatomy

Robert Stuebing, M.S.
Malaysian ecology

Donald Stewart, Ph.D.
Napo collections

Margaret K. Thayer, Ph.D
Systematics of Staphylinidae (Coleoptera)

Donald Taphorn, Ph.D.
Venezuelan Catfish

Jamie Thomerson, Ph.D.
Central and South American fishes

Robert Timm, Ph.D.
Host parasite relationship in mammals

John A. Wagner, Ph.D
Systematics of Pselaphidae (Coloeoptera)

Richard Wassersug, PH.D.
Tadpole research

John Wible, Ph.D.
Higher level taxonomy of mammals

Glen E. Woolfenden, Ph.D.
Florida Scrub Jay

Guanfu Wu
Chinese fauna, systematics

Chang Man Yang, B.S.
Decapods

Ermi Zhao, Ph.D.
Chinese fauna, systematics

VISITING SCIENTISTS AND CURATORS

Each year there are literally hundreds of students and scientists from around the world who come in to use the Field Museum collections and consult with the curators or professional services staff. The individuals listed below were each working at the Museum for a more extended period of time, ranging from one week to a full year.

Anthropology

Dr. Richard De Puma, Professor, School of Art and Art History, University of Iowa and Field Museum Research Associate.
Research on Etruscan collection.

Dr. Robert Feldman, Field Museum Research Associate.
Research on Peruvian archaeological collections.

Alan Ferg, Curatorial Assistant, Arizona State Museum.
Research on Apache collection and collector Charles Owens.

Dr. Gary Heathcote, Assistant Professor, College of Arts and Sciences, University of Guam.
Research project on crania from the Arctic and Pacific Northwest Coast.

Dr. Jean-Louis Heim, Professor and Sub-Director, National Museum of Natural History, Paris, France.
Research on skeletal collections from France.

Dr. Chuimei Ho, Field Museum Research Associate.
Research on archaeological materials from Ko Kho Khao, Thailand and Field Museum Chinese bronze, print, and mirror collections.

Elena Kourembana, Research Associate, University of California at Los Angeles.
Research on Mexican archaeological materials.

Laurene Lambertino-Urquizo, graduate student, Governors State University.
Research on Mexican pottery collections.

Dr. Charles Lincoln, Research Associate, Harvard University and Field Museum Research Associate.
Research on Mayan collections.

Dr. Donald McVicker, Professor, Northern Illinois University.
Research on Mayan pottery.

Dr. David Reese, Field Museum Research Associate.
Research on archaeological faunal materials.

Dr. Georges Sauvet, Professor, Universite Paris XIII, Villetaneuse, France.
Study of engravings from Bedeilhac, Ariege, France for comparison with cave art from the same site.

Dr. Patricia K. Townsend, Research Associate, Department of Anthropology, SUNY-Buffalo.
Research on the material culture of sago production.

Pua Van Dorpe and Robert Van Dorpe, Native Hawaiian Culture and Arts Program.
Research on Hawaiian *kapa* cloth.

Dr. Ronald Weber, Field Museum Research Associate.
Research on Pacific Northwest Coast collections and archives.

Dr. David Wilson, Assistant Professor, Southern Methodist University.
Research on Peruvian collections.

Botany

Thomas Antonio, Chicago Botanical Garden, Glencoe, IL, studied *Siparuna* from Costa Rica.

Harvey Ballard, Jr., The Nature Conservancy, East Lansing, MI, studied *Viola*.

Richard Bolli, Institut für Systematische Botanik, Zurich, Switzerland, studied *Sambucus*.

John Braggins, University of Auckland, New Zealand, worked on several families of leafy hepatics.

Lois Brako, Missouri Botanic Garden, St. Louis, MO, worked on a checklist for Peruvian plants.

Gerrit Davidse, Missouri Botanical Garden, St. Louis, MO, studied Poaceae.

Ava Nury Diaz, Centro de Estudios Conservacionistas - CECON - Universidad de San Carlos de Guatemala, Guatemala, Guatemala, studied Flora of Central America.

Robert Faden, Smithsonian Institution, Washington, DC, worked on Flora of North America.

Amada Gonzalez, Missouri Botanical Garden, St. Louis, MO, studied Palmae.

Favio Gonzalez, Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogota, Colombia, studied Aristolochiaceae.

Andrew J. Henderson, New York Botanical Garden, New York, NY, studied Palmae.

Colin Hughes, Research Staff, Department of Plant Sciences, University of Oxford, Oxford, England, studied Leguminosae.

S.K. Jain, National Botanical Research Institute, Lucknow, India, gave a seminar and visited herbarium.

Emmett Judziewicz, Smithsonian Institution, Washington, DC, studied Gramineae.

Jacquelyn Kallunki, New York Botanical Garden, Bronx, NY, studied Rutaceae.

K.M. Leelavathy, Professor, Mycology, University of Calicut, Kerala State, India, worked on Agarics of Kerala State, India.

Blanca Léon, Museum of San Marcos, Lima, Peru, working on Polypodiaceae, *Campyloneurum*.

David Lewis, Vidor TX, studied agarics of Eastern Texas.

David Lorence, National Tropical Botanical Garden, Lawai, HA, worked on Rubiaceae of Mesoamerica.

John M. MacDougal, Missouri Botanical Garden, St. Louis, MO., studied *Passiflora*.

Gordon McPherson, Missouri Botanical Garden, St. Louis, MO, identified families/genera of several Central American and Peruvian family indet.

Andrew Methven, Eastern Illinois University, Charleston, IL, studied collections, *Lactarius, Agaricales.*

Cirilo Nelson, University of Honduras, Tegucigalpa, Honduras, worked on the Flora of Honduras.

Eliane Norman, Stetson University, DeLand, FL, worked on Buddlyaceae.

Clark L. Ovrebo, Central State University, Edmond, OK, studied Tricholomataceae, Crepidotaceae, and Paxillaceae.

Gillian Perry, Western Australian Herbarium, Perth, Western Australia, studied *Xanthium*.

Noris Salazar, University of Panama, Panama City, Republic of Panama, studied Calymperaceae.

Mario Sousa, Herbario Nacional de Mexico, Mexico, studied Leguminosae.

E. John Staba, College of Pharmacy, University of Minnesota, Minneapolis, MN, studied pteridophytes *Matricaria*, and *Anthenis*.

Kim Steiner, Kirstenbosch Botanic Gardens, Claremont, South Africa, studied Scrophulariaceae.

John Strother, University of California, Berkeley, CA, studied Compositae.

Charlotte Taylor, Missouri Botanical Garden, St. Louis, MO., studied Rubiaceae.

Paulo Windisch, State University of Sao Paulo, Brazil, studied Hymenophyllaceae.

Kenneth Young, University of San Marcos, Lima, Peru, working on ecological studies.

Geology

John Alroy, Smithsonian, mammal biochronology.

David Bardack, University of Illinois/Chicago, Fossil Fishes.

Willy Bemis, University of Massachusetts, fossil fishes project.

Stephen Blackmore, British Museum, collaborative research with Crane.

Harold Bryant, University of Regina, carnivore evolution.

Arthur Busbey, Texas Christian University, permian tetrapods.

Sankar Chatterjee, Texas Tech, fossil fishes/fossil reptiles, permian and triassic tetrapods.

Robert DeMar, University of Illinois/Chicago, taught Paleontology class.

Mikhail Fedonkin, Soviet Academy of Sciences, revision of precambrian genus Suvorovella.

Elsa Marie Friis, Natural History Museum (Sweden), collaborative research with Crane.

Gary Galbreath, Northwestern University, fossil mammals.

Patrick Herendeen, Indiana University, fossil plants.

James Hopson, University of Chicago, taught paleontology class/research in collections.

Eric Lombard, University of Chicago, collaboration on paper with Bolt.

Kaj Pedersen, University of Aarhus, Denmark, collaborative research with Crane.

Guillermo Rougier, National Museum of Buenos Aires, South American work with Flynn.

Adam Urbanek, Polish Academy of Sciences, Fossil invertebrates. (Fellowship/Scholarship) structure of anti Darwinian theories.

Ann Walton, Southern Methodist University, South American rodents.

Andre Wyss, University of California/Santa Barbara, MS with Flynn/South American mammals.

Zoology

Mrs. Sophie Ann Brunner, Associate; preparation of skeletons.

Mr. Chris Carlton, student intern, University of Arkansas; worked on a group of pselaphidae beetles.

Dr. Joel Cracraft, Research Associate, University of Illinois at the Medical Center; research on avian systematics and evolutionary biology.

T. Dayan, Postdoctoral Fellow, Florida State University; research on carnivores.

Dr. Sharon Emerson, Research Associate, University of Utah; research on the functional anatomy of frogs.

Mrs. Ingrid Fauci, Associate; worked in the K.P. Schmidt Library carding and filing reprints and on literature searches related to research activities.

Dr. W. Greaves, Associate Professor, University of Illinois at Chicago; research on bovids.

Dr. Paul Heideman, Postdoctoral Fellow, University of Texas at Austin; research on Philippine bats.

Ms. Liora Horwitz, Hebrew University of Jerusalem, Thomas J. Dee Fellowship; research on sheep and goats.

Dr. Rainer Hutterer, Curator of Mammals, Museum of A. Koenig, Bonn; research on African shrews.

Dr. William Jeffries, Research Associate, Dickinson College; research on the epifauna of sea snakes and crustaceans.

Dr. Dorothy Karall, Associate; mounting and labeling of scientific illustrations.

Dr. Daryl Karns, Research Associate, Associate Professor of Biology, Hanover College; research on amphibians and reptiles of Sabah.

Dr. Peter Lowther, Research Associate, Field Museum; worked on nest and egg collection.

Antonio Machado, Research Associate, Professor of Neotropical Zoology, Universidad Central de Venezuela. Borg-Warner Robert O. Bass Visiting Scientist; worked on systematics of South American freshwater fishes and a manuscript on *Leporinus*.

Ms. Susan Mailen, student intern, Northwestern University; worked on verification of mammal specimens.

Mr. David Matusik, Field Associate; research on the taxonomy of Lepidoptera.

Mr. John Murphy, Field Associate; completing a book on herpetology of Trindad using Field Museum collections.

Dr. Philip Perkins, Taxonomic Entomologist, U.S. Department of Agriculture; research on aquatic coleoptera.

Dr. Beata Pokryszko, Visiting Scientist, Bass Scholarship, Museum of Natural History, Wroclaw University, Poland; research on land snails.

Ms. Jean Porterfield, student intern, Duke University; worked on histology and morphometrics of Caribbean silverside fishes.

Mr. Jorge Quintana, student intern, Northwestern University; worked on verification of mammal specimens.

Dr. Santiago Reig, Postdoctoral Fellow, Carnegie Museum, Pittsburg, PA.; research on North American weasels.

Dr. Eric Rickart, Curator of Mammals and Birds, Utah Museum of Natural History; research on Philippine rodents and bats.

Dr. Scott Robinson, Research Associate, State Natural History Survey Division; research on evolutionary ecology within the Icterinae.

Mr. Robert Stuebing, Research Associate, Universiti Kebangsaan, Malaysia; worked on the checklist of snakes of Borneo and a manuscript on the montane frogs of Borneo.

Dr. Walter Suter, Field Associate, Carthage College; research on the systematics of Scymaenidae (Coleoptera).

Ms. Tan Fui Lian, Technical Assistant, Office of Ecology, Mt. Kinabalu Park, Sabah Parks; worked on cataloging and measuring frogs.

Dr. Margaret Thayer, Research Associate, Field Museum; research on the systematics of Staphylinidae (Coleoptera).

Ms. Ruth Utzurrum, Associate Chairman, Silliman University, Philippines; research on Philippine bats.

Dr. John Wagner, Research Associate, Field Museum; research on the systematics of Pselaphidae.

Mr. Paul Willis, Graduate Student, University of New South Wales, Australia; research on crocodilians.

Ms. Sandra Wilmore, intern; collections management of birds specimens.

Dr. Vladimir Yaskin, Moscow University; research on North American rodents.

Dr. Bruce Young, Postdoctoral Fellow, University of Calgary, Alberta, Canada; research on snakes and veranid lizards.

1990 PUBLICATIONS

ANTHROPOLOGY

Bennet Bronson

1990. REVIEW. Southeast Asia in the Age of Commerce, A. Reid. *Ethnohistory*, 37 (2): 217-218.

1990. (with C.M. Ho) The Black Specks in Xuande Blue: A Historical Background. *Archeomaterials*, 2 (2): 119-121.

1990. Glass and Beads at Khuan Lukpad, Thailand. Pp. 213-230 in *Southeast Asian Archaeology* 1986. (I.C. Glover and E. Glover, eds.) BAR International Series 561. Oxford.

Winifred Creamer

1990. "Archaeologists Ethical Dilemmas: Collecting, Collectors, Collections", *Anthropology News*, May 1990.

1990. Review of Excavations on Black Mesa, 1983: A Descriptive Report. Edited by Andrew L. Christenson and William J. Parry. Southern Illinois University at Carbondale Center for Archaeological Investigations, *Research Paper* 46 [1985]. *North American Archaeologist II(1):60-62.*

1990. Review of Pre-Hispanic Occupance in the Valley of Sonora, Mexico: Archaeological Confirmation of Early Spanish Reports. By William Doolittle. *Anthropological Papers of the University of Arizona* 48 [1988]. *Ethnohistory 37(2):192-294.*

Robert Feldman

1990. Pre-ceramic Unbaked Clay Figurines From Aspero, Peru. In *The New World Figurine Project, Volume 1*. (Terry Stocker, ed.) Research Press, Provo, Utah.

Jonathan Haas

1990. Foreward to *The Evolution of Political Systems*. (Steadman Upham, ed.) Cambridge University Press.

1990. Foreward to *The Emergence of Modern Humans*. (Erik Trinkhaus, ed.) Cambridge University Press.

1990. *The Anthropology of War* (editor). Cambridge University Press.

1990. Preface to *The Anthropology of War*. (J. Haas, ed.) Cambridge University Press.

1990. Warfare and the Evolution of Tribal Politics in the Prehistoric Southwest. In *The Anthropology of War*. (J. Haas, ed.) Cambridge University Press.

1990. Repatriation at the Field Museum. *Museum Anthropology*, August 1990. Council for Museum Anthropology, Tempe AZ.

1990. Reconsecration of Human Remains at Field Museum. *Field Museum of Natural History Bulletin*, January/February 1990.

Chuimei Ho

1990. (with B. Bronson) The Black Specks in Xuande Blue: A Historical Background. *Archeomaterials*, 2 (2): 119-121.

Phillip Lewis

1990. Tourist Art, Traditional Art and the Museum in Papua New Guinea. Pp. 149-163 in *Art and Identity in Oceania*. (A. Hanson and L. Hanson, eds.) University of Hawaii Press, Honolulu.

1990. Fiji: vision of a People, A Photographic Exhibit by Brigitte d'Ozouville. *Pacific Arts*, 1-3: 86-87.

David Reese

1990. (1986) (with A. Lebessi) Recent and Fossil Shells from the Sanctuary of Hermes and Aphrodite, Syme Viannou, Crete. Pp. 183-188 in *Archaiologike Ephemeris 1986*.

1990. (1989) Treasures from the Sea: Shells and Shell Ornaments from Hasanlu IVB. *Expedition*, 31 (2-3): 80-86.

1990. (1989) Molluscs. Part iv in G. Clark, et al., The Food Refuse of an Affluent Urban Household of the Late Fourteenth Century: Faunal and Botanical Remains from the Palazzo Vitelleschi, Tarquinia (Viterbo). *Papers of the British School at Rome LVII*, 240, 286-287.

1990. Marine and Worked Shells. In *Town and Country in Southeastern Anatolia II The Stratigraphic Sequence at Kurban Hoyuk*. (G. Algaze, ed.) Oriental Institute Publications 110. The Oriental Institute of the University of Chicago, Chicago. Pp. 410-416.

1990. REVIEW. Marine Molluscan Remains from Franchthi Cave, J. C. Shackleton. *American Journal of Archaeology*, 94 (4): 682-683.

1990. (with C. Sease) Excavating the Holy City of Nippur. *In the Field: The Bulletin of the Field Museum of Natural History*, 61 (4): 11.

Catherine Sease

1990. A New Means of Controlling Relative Humidity in Exhibit Cases. *Collection Forum*, 6 (1): 12-20.

1990. Controlling Relative Humidity in Museum Cases. Pp. 164-174 in *The Sourcebook 1990*. American Association of Museums, Washington, D.C.

1990. (with D. Reese) Excavating the Holy City of Nippur. *In the Field: The Bulletin of the Field Museum of Natural History*, 61 (4): 11.

Charles Stanish

1990. (with L. Watanabe) Ocupaciones Domesticas en el Periodo Tiwanaku Tardio, Otora, Moquegua. Pp. 75-95 in *Trabajos Arqueologicos en Moquegua, Peru*, v.2. (L. Watanabe, M. Moseley, and F. Cabieses, eds.)

1990. Economias Agrarias Post-Tiwanaku en la Cuenca del Rio Moquegua. Pp. 115-160 in *Trabajos Arqueologicos en Moquegua, Peru*, v.2. (L. Watanabe, M. Moseley, and F. Cabieses, eds.)

1990. (with I. Pritzker) Reconocimiento Arqueologico en el Sur del Peru. (Translation of Stanish and Pritzker, 1983.) Pp. 167-176 in *Trabajos Arqueologicos en Moquegua, Peru*, v. 2. (L. Watanabe, M. Moseley, and F. Cabieses, eds.)

1990. Review of Andean Past. *American Antiquity*, 55 (1): 198.

1990. (with Brian S. Bauer) Killke and Killke-Related Pottery from Cuzco, Peru, in the Field Museum of Natural History. *Fieldiana: Anthropology*, n.s. 15, 17pp.

John Terrell

1990. Storytelling and prehistory. Pp. 1-29 in Archaeological Method and Theory, vol. 2. (M. B. Schiffer, ed.)

1990. REVIEW. Archaeology of the Lapita Cultural Complex: A Critical Review, P. V. Kirch and T. L. Hunt, eds. *American Anthropologist*, 92: 827.

1990. REVIEW. Man on the Rim: The Peopling of the Pacific, Alan Thorne and Robert Raymond. *Archaeology in Oceania*, 25:44.

1990. (with R. Welsch) Return to New Guinea. *In the Field: The Bulletin of the Field Museum of Natural History*, 61 (5): 10-11.

1990. Current Archaeology in the Pacific. *Pacific Arts,* 1-2: 6-8.

James VanStone

1990. The Nordenskiold Collection of Eskimo Material Culture from Port Clarence, Alaska. *Fieldiana: Anthropology*, n.s. 14: 1-56.

Robert Welsch

1990. (with J. Terrell) Return to New Guinea. *In the Field: The Bulletin of the Field Museum of Natural History*, 61 (5): 10-11.

BOTANY

William Burger

1990. Families #80, (with H. van der Werff) Lauraceae and #81, Hernandiaceae, in Flora Costaricensis. *Fieldiana: Botany*, n.s. No. 23: 1-138.

Michael O. Dillon

1990. (with A. Sagastegui A.). *Oligandra* Less. revisited and the need for a new genus, *Pseudoligandra* (Asteraceae: Inuleae). *Taxon* 39: 125-128.

1990. (with L. Constance). A new peltate *Hydrocotyle* (Umbelliferae) from Northern Peru. *Brittonia* 42(4): 257-259.

1990. (with P.W. Rundel). The Botanical Response of the Atacama and Peruvian Desert Floras to the 1982-83 El Nino Event. In: P.W. Glynn (Ed.), *Global Ecological Consequences of the 1982-83 El Nino-Southern Oscillation*, Elsevier Oceanography Series, pp. 487-504.

John J. Engel

1990. Studies on Geocalycaceae. I. The taxonomic position of *Chiloscyphus amplectens* (Mitt.) Engel & Schust. together with refinements in *Heteroscyphus* Schiffn. *Journal Hattori Botanical Laboratory* 68: 303-31.

1990. Falkland Islands (Isla Malvinas) Hepaticae and Anthocerotophyta: A Taxonomic and Phytogeographic Study. *Fieldiana, Bot.* n.s. 25: 1-209.

1990. Studies on Geocalycaceae (Hepaticae). II. *Stolonivector*, a new genus from New Zealand. Journal Hattori Botanical Laboratory 69: 79-86.

1990. *Saccogyna, Saccogynidium, Schistochila, Schistochilaster, Tetracymbaliella* and *Xenocephalozia*. In: Geissler, P. & H. Bischler (ed.), *Index Hepaticarum*. Vol. 12: J. Cramer, Berlin.

1990. (with B. Tan). A preliminary study on the affinities of Philippine, Bornean and New Guinean hepatics. *Tropical Bryology* 2: 265-272.

1990. Index Hepaticarum Supplementum: 1982-1983. *Taxon* 39: 245-254.

Michael Huft

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H. Bradley Shaffer

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Petra Sierwald

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SCIENTIFIC SUPPORT SERVICES

Computing

Peter E. Lowther

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COLLECTION AND RESEARCH

Current Active Grants

Anthropology

Bennet Bronson
Excavations at Ko Kho Khao, Southern Thailand. National Geographic Society. $12,400. November 1988 - June 1990.

Ancient Trade at Ko Kho Khao and Laem Pho, Thailand. National Geographic Society. $10,890. February 1990 - June 1991. Co-PI - Chui Mei Ho.

Winifred Creamer
Warfare, Disease, and Colonial Contact in the Pueblos of Northern New Mexico. Harry Frank Guggenheim Foundation. $25,080. July 1, 1988 - April 30, 1991. Co-PI - Jonathan Haas.

Robert Feldman
Cerro Baul: Chronology and Function at a Wari Frontier Settlement. Wenner-Gren Foundation for Anthropological Research, Inc. $9,000. August 1989 - March 1990.

Paul Goldstein
Administrative Architecture of the Tiwanaku Periphery. Wenner-Gren Foundation for Anthropological Research, Inc. $6,825. January 1990 - December 1990.

Jonathan Haas
Warfare, Disease and Colonial Contact in the Pueblos of Northern New Mexico. Harry Frank Guggenheim Foundation. $25,080. October 1989 - March 1991. Co-PI - Winifred Creamer.

Recordation of Human Skeletal Remains Conference, Chicago IL, November, 1990. National Science Foundation. $13,180. December 1990 - November 1991.

Chui Mei Ho
Export Trade in Guangdong Ceramics During the 9th - 13th Centuries. Committee on Scholarly Communication with the People's Republic of China (National Academy of Sciences). $17,850. September 1989 - January 1990.

Phillip Lewis
A New Means for Controlling Relative Humidity. National Endowment for the Arts. $20,000. April 1988 - March 1990. Co-PI - Catherine Sease Lewis.

David Reese

Analysis of 1988 Bones and Shells from Akrotiri Aetokremnos, Cyprus. L. S. B. Leakey Foundation. $3,000. May 1990 - December 1990.

Catherine Sease

A New Means for Controlling Relative Humidity. National Endowment for the Arts. $20,000. April 1988 - March 1990. Co-PI - Phillip Lewis.

Field Museum Conservation Survey. Institute of Museum Services. $25,000. September 1990 - December 1991.

Charles Stanish

Archaeological Research in Juli, Peru: The Moyopampa Raised Field System. H. John Heinz III Charitable Trust. $7,000. January 1990 - December 1990.

Prehispanic State Formation in the Lupaqa Area, Peru. National Science Foundation. $37,405. August 1990 - July 1991.

John Terrell

"Not In Isolation: Regional Studies in Melanesian Anthropology" Conference. Wenner-Gren Foundation for Anthropological Research, Inc. $8,575. April 1990 - December 1991.

Botany

Michael O. Dillon

Biogeography and Evolution of the Lomas Formations of Peru and Chile. National Science Foundation. BSR-8513205. $46,703. 1986-1990.

John J. Engel

Curatorial Support for the Field Museum Herbarium. National Science Foundation Grant. BSR-8801197. $458,883. 1988-1991.

Botany Type Photo Treatment. Institute of Museum Services Grant. $24,973. 1990. Co-PI - Christine Niezgoda.

Restoration of the Berlin Negatives. National Science Foundation Grant. BSR-8913267. $105,000. 1990-1993. Co-PI - Christine Niezgoda.

Plant Collection Program: South East Asia. National Cancer Institute. NO1-CM-57746-30. Sub-contract with University of Illinois. 1990-1991. $14,047.

Gregory M. Mueller

Mushrooms and Other Fungi of Costa Rican Oak Forests. The John D. and Catherine T. MacArthur Foundation. 875101. $22,000. 1989-1991.

The Agaric Genus *Laccaria* in South America: A Taxonomic and Biological Study. National Science Foundation. BSR-8607106. $144,955. 1986-1990.

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Christine Niezgoda

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Rudolf M. Schuster

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Publication Subsidy of Vol. V & VI of "The Hepaticae and Antheorocerotae of North America." National Science Foundation. BSR-8914364. $17,014. 1990-1992.

Geology

Peter Crane

Floral Structure and Systematics of Mid-Cretaceous Angiosperms. National Science Foundation, $110,000, 1988-1990.

Acquisition of New Scanning Electron Microscopy Facilities at Field Museum of Natural History. National Science Foundation, $65,000. 1988-1991

John Flynn

Biochronology and Geochronology of Friasian (Middle Miocene) land mammal age: Chile and Columbia. National Science Foundation, $24,524. 1990-1991.

Acquisition of paleomagnetics/video image analysis equipment. Philip M. McKenna Foundation, Inc., $22,800. 1990.

Lance Grande

Systematics, osteology and historical biogeography of paddlefishes. National Science Foundation. $36,008. 1988-1991.

Patrick Herendeen

Paleobotanical patterns in the evolution of angiosperm secondary xylem and their phylogenetic significance. National Science Foundation. $32,756. 1990-1991.

Scott Lidgard

Phylogeny and Morphometry in the Cenozoic Bryozoan Adeonellopsis. The National Science Foundation. $61,519. 1990-1991.

Support for Care and Use of Systematic Collections of Mazon Creek Fossil Animals and Plants. National Science Foundation, $152,995. 1987-1990.

Matthew Nitecki

FMNH Spring Systematics Symposium 1990. National Science Foundation. 1991. $10,486.

Ed Olsen

Trace element and isotope studies in oxide/phosphate/silicate inclusions of iron meteorites. National Aeronautics and Space Administration, $16,505. 1989-1990.

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Zoology

Barry Chernoff

Development and Support for MUSE, a microcomputer-based system for managing natural history collections, National Science Foundation, Biological Research Resources, $145,233.

Lawrence Heaney

Computer Database Verification and Storage of Orphaned African Collection, $212,130. Co-PIs. D. B. Patterson and J. Kerbis. National Science Foundation. 1989-1992.

Conservation of Mammalian Diversity in the Philippines, $295,000, with Silliman University and the Philippine National Museum; The John D. and Catherine T. MacArthur Foundation.

Robert Inger

Herpetofaunal communities in Borneo and the effects of logging, $27,400. Co-PI H. K. Voris. National Geographic Society.

Processes affecting variation of anuran communities in Bornean forests, $175,000; with R. Stuebing and the Universiti Kabangsaan, Malaysia. The John D. and Catherine T. MacArthur Foundation.

John Kethley

Support for the care and use of the collections of insects and other arthropods of Field Museum of Natural History, $710,047. Co-PI - A.F. Newton, National Science Foundation. 1989 - 1994.

Scott Lanyon

Collection computerization in the Division of Birds, Field Museum, $140,057. National Science Foundation. 1987 - 1991.

Phylogenetic affinities within the blackbird genus Agelaius (Icterinae), $118,974, 1987-90; National Science Foundation.

Alfred Newton, Jr.

Revision of New World *Platydracus* Species, $89,009. National Science Foundation. 1989 - 1992.

Support for collections of insects and other arthropods of Field Museum, $710,047. Co-PI - J.B. Kethley. National Science Foundation. 1989 - 1994.

Bruce Patterson

Facilities Support for the mammal collection, Field Museum of Natural History, $203,714. Co-PIs - L.R. Heaney and J.C. Kerbis, National Science Foundation. 1989 - 1992.

Harold Voris

Herpetofaunal communities in Bornean rain forests and effects of logging, $27,400. Co-PI - R.F. Inger; National Geographic Society.

Photography

Nina Cummings

Preservation of the Photographic Collection. National Endowment for the Humanities, $184,000. Co-PI Catherine Sease, Department of Anthropology. 1989 - 1991.

COLLECTIONS AND RESEARCH

Grant Awards in 1990

Crane, Peter and Lidgard, Scott (Geology) 12/90
"Global Patterns of Cretaceous Vegetational Change"
American Chemical Society

Total: $ 40,000

Engel, John; Niezgoda, Christine (Botany) 09/90
"Restoration of the Berlin Negatives"
National Science Foundation

Total: $105,000

Engel, John (Botany) 11/90
University of Illinois at Chicago

Total: $ 14,047

Flynn, John (Geology) 01/90
"Paleomagnetic Equipment/Video Image Analysis Grant"
McKenna Foundation

Total: $ 22,800

Flynn, John (Geology) 07/90
"Biochronology and Geochronology of Middle Miocene of South America"
Duke University Medical Center

Total: $ 24,524

Goldstein, Paul (Anthropology) 4/90
"Administrative Architecture of the Tiwanaku Periphery"
Wenner-Gren Foundation

Total: $ 6,825

Goodman, Steven (Zoology) 01/90
"The Cultural Evolution of Plant Resource Utilization Across the Sharo-Sindian Phytogeographical Region: Field Work on the Ethnobotany of the Baluchistan Province of Pakistan"
Smithsonian Institution

Total: $ 10,000

Haas, Jonathan (Anthropology) 12/90
"Recordation of Human Skeletal Remains Conference"
National Science Foundation

Total: $ 13,180

Heaney, Larry (Zoology) 12/90
"Conservation of Mammalian Diversity in the Philippine Islands: Training, Inventory, and Resource Development"
MacArthur Foundation

Total: $295,000

Herenden, Patrick; Crane, Peter (Geology) 09/90
"Long and Medium Term Research: Paleobotanical Patterns in the Evolution of angiosperm Secondary Xylem and Their Phylogenetic Significance"
National Science Foundation

Total: $ 33,006

Inger, Robert 12/90
"Processes Affecting Variation of Anuran Communities in Bornean Forests"
MacArthur Foundation

Total: $175,000

Inger, Robert (Zoology) 11/90
"The Biology and Systematics of Southeast Asian Voiceless Frogs"
The University of Utah

Total: $ 11,500

Lidgard, Scott (Geology) 09/90
"Phylogeny and Morphometry in the Cenozoic Bryozoan Adeonellopsis"
National Science Foundation

Total: $ 61,519

Nitecki, Matthew (Geology) 03/90
"Field Museum Spring Systematics Symposium, May 1990"
National Science Foundation

Total: $ 10,486

Olsen, Edward (Geology) 01/90
"Trace Element and Isotope Studies in Oxide/Phosphates/Silicate Inclusions of Iron Meteorites"
NASA

Total: $ 15,112

Schuster, Rudolf (Botany) 08/90
"Publication Subsidy of Volumes V & VI of the Hepaticae and Anthocerotae of North America"
National Science Foundation

Total: $ 17,014

Sease, Catherine (Anthropology) 08/90
"FMNH Conservation Survey"
Institute of Museum Services

Total: $ 25,000

Stanish, Charles (Anthropology) 02/90
"Archaeological Research in Juli, Peru: The Moyopampa Raised Field System"
H. John Heinz III Charitable Trust

Total: $ 7,000

Stanish, Charles (Anthropology) 06/90
"Prehispanic State formation in the Lupaqa Area, Peru"
National Science Foundation

Total: $ 37,405

Terrell, John (Anthropology) 07/90
"Not in Isolation: Regional Studies in Melanesian Anthropology"
Wenner-Gren Foundation for Anthropological Research

Total: $ 8,575

Welsch, Robert (Anthropology) 02/90
"A.B. Lewis Collection of Melanesian Art and Material Culture"
National Endowment for the Arts

Total: $ 21,600

TOTAL COLLECTIONS AND RESEARCH GRANTS FOR 1990

Grand Total: $954,593

COLLECTIONS AND RESEARCH

Scientific Travel

Anthropology

Bennet Bronson
Thailand January - April, 1990.
Fieldwork - Analysis of objects excavated in 1989 and survey of sites in southern Thailand

Wake Forest University, N.C. June, 1990.
Research - evaluation of Asian collections

Glen Cole
Waterloo, Canada June, 1990.
Annual Meeting - American Quaternary Association and Canadian Quaternary Association

Winifred Creamer
Barcelona, Spain April - May, 1990.
Seminar

San Marcos Pueblo NM June - August, 1990.
Field Work

Washington, D.C. December, 1990
National Geographic Society, consulting

Santa Fe, NM June - July, 1990.
Founder's Council Trip

Costa Rica and Panana Canal November - December, 1990.
Field Museum Trip

Jonathan Haas
Netherlands, Switzerland, England April, 1990.
Visits to museums

Santa Fe, NM June, 1990.
Founder's Council Trip

San Marcos Pueblo, NM August, 1990.
Field Work

New Orleans, LA November - December, 1990.
Annual Meeting of American Anthropological Association

Charles Stanish
Chicago, IL February, 1990
Annual Meeting - Midwest Andeanist Society

Las Vegas, NV April, 1990
Annual Meeting - Society of American Archaeology

Peru May - July, 1990
Fieldwork - Archaeological research

Peru August - October, 1990
Fieldwork - Archaeological research

New Orleans, LA November, 1990
Annual Meeting - American Anthropological Association

John Terrell
Hilo, HI March, 1990
Lectures - Presented at the University of Hawaii - Hilo

Lihue, HI March, 1990
Annual Meeting - Association for Social Anthropology in Oceania

Sydney, Australia March, 1990
Research - Australian Museum

Aitape, West Sepik Province, Papua New Guinea
March - May, 1990
Fieldwork - A. B. Lewis Research Project

Auckland, New Zealand May, 1990
Research - University of Auckland

Honolulu, HI May, 1990
Research - Bishop Museum and University of Hawaii

Auckland, New Zealand November, 1990
Meeting - Taonga Maori Conference

Tokomoru Bay, East Coast, New Zealand.
November - December, 1990
Fieldwork and Research - Maori House

James VanStone
Fairbanks, AK March, 1990
Annual Meeting - Alaska Anthropological Association
Research - University of Alaska Museum and Archives of the University of Alaska Library

Indianapolis, IN July, 1990
Lectures - Presented in connection with the "Crossroads of Continents" exhibit at the Eiteljorg Museum

Robert Welsch
Lihue HI March, 1990
Annual Meeting - Association of Social Anthropology in Oceania

Aitape, West Sepik Province, and Kiunga District, Western Province, Papua New Guinea. March - June, 1990
Field Work - A. B. Lewis Research Project

Botany

William C. Burger
Costa Rica October - November, 1990.

Richmond, VA. August, 1990.
Annual American Institute of Biological Sciences Meetings.

St. Louis, MO. October, 1990.
Annual Fall Systematics Symposium, Missouri Botanical Garden.

Michael O. Dillon
Peru, October-26 November, 1990.
Fieldwork

California. April, 1990.
Herbarium, University of California, Berkeley, CA

Claremont CA. May, 1990.
6th Annual Southwestern Systematics and Evolution Symposium, Rancho Santa Ana Botanic Garden.

Richmond, VA. August, 1990.
Annual American Institute of Biological Sciences Meetings, Richmond, VA

Thomas G. Lammers
Chile. October - November, 1990.
Fieldwork

Richmond, VA. August, 1990.
Annual American Institute of Biological Sciences Meetings

St. Louis, MO. October, 1990.
Annual Fall Systematics Symposium, Missouri Botanical Garden, St. Louis, MO

Gregory M. Mueller
Madison. WI. June, 1990.
Annual Mycological Society of America meetings, Madison, WI.

Regensburg, German. August - September, 1990.
IV International Mycological Congress, Regensburg, Germany.

Robert G. Stolze
California. November - December, 1990.
Herbarium, University of California, Berkeley, California.

Geology

John Bolt
Florida, May, 1990
Mote Marine Lab, Conference, invited paper.

Scotland, May, 1990.
Study museum collections

England, May, 1990.
Study museum collections

Kansas, November, 1990
University of Kansas, SVP meeting

Peter Crane

Ecuador, January, 1990.
Fieldwork

Texas, March, 1990.
Southern Methodist University, seminar and fieldwork

Denmark, March, 1990.
Aarhus University, collaborative research

Denmark, December, 1990,
Research

England, March, 1990.
British Museum, meetings and seminars

England, December, 1990.
Thesis exam and research

Minnesota, April, 1990.
University of Minnesota, seminar

Michigan, October, 1990.
University of Michigan at Ann Arbor, seminar

Massachusetts, October, 1990
University of Massachusetts at Amherst, seminar.

John Flynn

Michigan, January, 1990.
Hope College, lecture

Ecuador/Galapagos, March, 1990.
Tour for FMNH

New York, May, 1990.
Columbia University, lecture/research for NSF proposal

New York, May - June, 1990.
American Museum, Symposium/Research

New York, June, 1990.
Society of Vertebrate Paleontologists collections computerization committee

Wyoming, July, 1990.
Fieldwork

Kansas, November, 1990.
University of Kansas, Society of Vertebrate Paleontologists meeting

France, November - December, 1990.
Ecole des Mines Fontainbleu, lecture/meeting International Geological C. P. project

Lance Grande
West Virginia, January, 1990.
U. S. Park Service, consultation on new U. S. Park Service museum

New York, January, 1990.
American Museum, study trip

Wyoming, May, 1990.
Geological Society of America meeting

Wyoming, May, 1990.
Fieldwork

North Carolina, June, 1990.
College of Charlesotn, attend and present talk at meeting

Kansas, November, 1990.
University of Kansas, invited talk at meeting

Washington, D.C., November, 1990.
U. S. Museum of Natural History, study trip/editing manuscript.

Scott Lidgard
Washington, D.C., June, 1990.
November, 1990
U S Museum of Natural History, research on collections

Dallas, Texas, October - November, 1990.
Present paper, Geological Society of America

Matthew Nitecki
Wisconsin, August, 1990.
Milwaukee Public Museum, collection study

Michigan, September, 1990.
University of Michigan/Ann Arbor, collaborative research

Michigan, September, 1990.
Queen's University, conference

Ohio, November, 1990.
Conference

Edward Olsen
California, February, 1990.
California Institute of Technology, NASA research project

Texas, March, 1990.
NASA/Johnson Space Center, space research conference

Purdue University, April, 1990.
July, 1990.
August, 1990.
NASA research project

Washington, D.C., June, 1990.
U. S. Museum of Natural History, collaborative research

Washington, D.C., December, 1990.
U. S. Museum of Natural History, phosphate melting experiments

Olivier Rieppel
South Carolina, June, 1990.
American Society ofIchthyologists and Herpetologist meeting

Kansas, October, 1990.
University of Kansas, attend meeting/co-chair symposium

Zoology

Rudiger Bieler
Smithsonian Marine Station, Harbor Branch Oceanographic Institution, Fort Pierce, Florida February - March, 1990
August - September, 1990.

Barry Chernoff
Charleston, SC June, 1990.
American Society of Ichthyologists and Herpetologists

Philadelphia, PA April - May, 1990.
Academy of Natural Science

Robert Inger
Malaysia July - October, 1990.
University Kebangsaan and Sabah Parks

Washington, DC April, 1990.
U.S. National Museum of Natural History, Smithsonian Institution,

Lawrence Heaney
Frostburg, MD June, 1990.
American Society of Mammalogists

Gainesville, FL June, 1990.
Society of Conservation Biologists

Maryland July, 1990.
International Congress of Systematics and Evolutionary Biology

Utah July - August, 1990.
University of Utah, Raft River Mountains

Mexico City November, 1990.
National University of Mexico

Washington, DC November - December, 1990.
Smithsonian Institution

John Kethley
Czechoslovakia August, 1990.
8th International Congress of Acarology

Spain, France and Portugal August - September, 1990.
Fieldwork

Baton Rouge, LA November - December, 1990.
Entomology Collections Network

New Orleans, LA November - December, 1990.
Entomological Society of America

Scott Lanyon
New Zealand November - December, 1990.
International Ornithological Congress

Alfred Newton
Baton Rouge, LA November - December, 1990.
Entomological Collections Network

New Orleans, LA December, 1990.
Entomological Society of America

Bruce Patterson
Frostburg, MD June, 1990.
American Society of Mammalogists

Brasil, Sao Paulo July, 1990.
Estacion Biologica de Broaceia and Universidade de Sao Paulo

Janet Voight
San Antonio, TX December - January, 1990.
American Society of Zoologists

Harold Voris
New Orleans, LA August, 1990.
Society for the Study of Amphibians and Reptiles

Australia November, 1990.
Great Barrier Reef Tour

Borneo October, 1990.
University of Malaysia, Kota Kinabalu Kampus

Thailand May, 1990.
Phuket Marine Biological Center

FIELD MUSEUM LIBRARY

Field Museum Library maintains and builds collections of books, journals and other special materials that are essential to the Museum's research, exhibition, and educational programs. The Library serves a number of different publics, each with distinct needs, and strives to balance the requirements of all users in order to provide the best possible service. In addition to the services provided to Museum staff, volunteers, interns, visiting scientists, specialists and consultants, Library collections are available to the international community of natural science researchers through the Interlibrary Loan Program. Library resources are also offered to the public at large through the Library's Public Reading Room.

The problem of the dramatic escalation in the cost of scientific books and journals, described in detail in last year's report, has not been solved and continues to undermine acquisitions in most U.S. libraries. The cost increase of journals currently received by Field Museum Library stands at 15% over the cost in 1989. Only further selective cancellations of journal subscriptions contained the cost of the journal collections, and book acquisitions were held to the same rate as in 1989.

On a more optimistic note, 1990 brought the founding of The Friends of Field Museum Library. The inaugural program meeting of the Friends in May featured the Library's magnificent and unusual copy of John James Audubon's *The Birds of America*. Audubon was also the focus of a Friends fundraiser held at Douglas Kenyon Gallery in September, where an exhibition of original paintings by Audubon and personal artifacts of the Audubon family were on view. The first issue of *Gatherings, The Newsletter of the Friends of Field Museum Library*, also appeared in September 1990.

Among the first benefits provided by the Friends has been the acquisition of two valuable works to the Rare Book Collections. Richard Bradley's *A philosophical account of the works of nature* (London, 1721), is an excellent example of the types of wide-ranging debates that animated the meetings of the Royal Society in the decades immediately preceding the systematizing works of Linnaeus. The hitherto unpublished bird paintings of Andrew Jackson Grayson can now be viewed in the *Birds of the Pacific Slope* (San Francisco, The Arion Press, 1986), a portfolio of facsimile reproductions of the paintings Grayson regarded as a continuation of Audubon's great work.

PROFILE OF FIELD MUSEUM LIBRARY
HOLDINGS AND COLLECTION ACTIVITY, 1990

SUMMARY TABLE

LIBRARY	VOLUMES HELD 12-31-89	VOLUMES ADDED: BOOKS ACQUIRED BY: PURCHASE	EXCHANGE	GIFT	JOURNALS	VOLUMES HELD 12-31-90	VOLUMES USED: MUSEUM STAFF*	PUBLIC VISITORS	INTER-LIBRARY LOANS
GENERAL	100652	193	53	147	473	101518	1795	751	233
ANTHROPOLOGY	35958	249	49	120	133	36509	977	843	141
BOTANY	30161	85	39	157	139	30581	390	119	50
GEOLOGY	35096	65	20	55	181	35417	268	198	52
ZOOLOGY:									
BIRDS	11208	57	2	27	21	11315	277	107	39
MAMMALS	3805	34	2	18	15	3874	368	93	44
INSECTS	13934	27	29	16	68	14074	207	76	32
INVERTS	3752	17	8	22	12	3811	49	25	26
FISHES	937	17	6	7	8	975	21	20	13
AMPH/REPTILES	1439	53	1	38	5	1536	50	40	43
ZOOLOGY TOTAL	35075	205	48	128	129	35585	972	361	197
TOTAL, ALL LIBRARIES	236942	797	209	607	1055	239610	4402	2263	673

*FIGURES FOR USE OF LIBRARY COLLECTIONS BY MUSEUM STAFF ARE DERIVED FROM CIRCULATION CHARGE FORMS FILLED OUT WHEN STAFF TAKE LIBRARY MATERIALS FROM THE STACKS TO THEIR OFFICES. NO FIGURES ARE AVAILABLE FOR THE AMOUNT OF ONSITE USE IN THE LIBRARIES, INCIDENTAL BROWSING AT THE SHELVES, OR USE OF LIBRARY MATERIALS FOR PHOTOCOPYING.

PROFILE OF FIELD MUSEUM LIBRARY
HOLDINGS AND COLLECTION
ACTIVITY 1990

	VOLUMES HELD 12-31-89	VOLUMES ADDED: BOOKS ACQUIRED BY: PURCHASE	EXCHANGE	GIFT	JOURNALS	VOLUMES HELD 12-31-90	VOLUMES USED: MUSEUM STAFF	PUBLIC VISITORS	INTER-LIBRARY LOANS
GENERAL WORKS. ENCYCLOPEDIAS. INDEXES	1048					1048	1	1	
MUSEUMS. MUSEOLOGY	1076	13	3	6	8	1106	50	24	13
PERIODICALS (GENERAL)	675					675	1	4	
ACADEMIES & LEARNED SOCIETIES (GENERAL)	2222	1			8	2231	3	2	3
PHILOSOPHY. PSYCHOLOGY. RELIGION	1456	5	2	5		1468	26	25	
AUXILIARY SCIENCES OF HISTORY (SEE NOTE 1, P.3)	460	2	2		1	465	11		
HISTORY: GENERAL & OLD WORLD (SEE NOTE 2, P.3)	6997	15	4	30	14	7060	159	58	8
HISTORY: AMERICAS	4938	7	4	9	8	4966	17	19	5
GEOGRAPHY	5538	13	1	7	22	5581	112	34	4
ANTHROPOLOGY									
PERIODICALS	9367	1	2	1	56	9427	129	127	22
COLLECTIONS. GENERAL WORKS, METHODOLOGY, ETC.	589	2	1	1	3	596	16	10	2
PHYSICAL ANTHROPOLOGY	642	7	1	1	4	655	38	6	4
ETHNOLOGY. GENERAL WORKS	850	16	3	8	3	880	62	26	3
GEOGRAPHIC DIVISIONS									
AMERICAS	5235	85	12	26	13	5371	165	306	34
EUROPE	60		1			61		5	
ASIA	874	2	1			877	2	7	2
AFRICA	1832	11	1	4	3	1851	111	24	6
OCEANIA, AUSTRALIA, NEW ZEALAND	1467	28	6	19	2	1522	146	44	12
SPECIAL REGIONS & RACES	32					32		1	
ARCHEOLOGY									
PERIODICALS	4172				32	4204	44	49	13
COLLECTIONS; GENERAL WORKS; METHODOLOGY	734	20		3	2	759	33	18	6
GEOGRAPHIC DIVISIONS (SEE NOTE 3, P.3)	2191	29	5	12	2	2239	69	83	17
FOLKLORE	656				1	657	11	16	1
MANNERS & CUSTOMS (GENERAL)	198	3	3	2		206	9	11	
RECREATION	126	1		2		129	5	1	3
SOCIAL SCIENCES	1489	4	1	4	1	1499	20	7	2
POLITICAL SCIENCE	243					243	3		
LAW	95					95	2		1
EDUCATION	183					183			
MUSIC	269	1	1		1	272	5	2	
FINE ARTS	2559	15	9	26	8	2617	79	63	10
LANGUAGE & LITERATURE	2742	23	2	11	3	2781	34	17	7
SCIENCE									
PERIODICALS (GENERAL; INTERNATIONAL)	2501				22	2523	71	15	
SOCIETIES (CHIEFLY PERIODICALS)	15669	1	1		65	15736	95	73	4
COLLECTIONS; HISTORY OF SCIENCE	1225	2		3	1	1231	26	9	
MATHEMATICS	102					102	1	7	1
ASTRONOMY	335	1		1		337		4	
PHYSICS	551	2		1		554	6	5	1
CHEMISTRY	271			4		275	1	3	
GEOLOGY									
PERIODICALS (GENERAL & INTERNATIONAL)	1733				10	1743	10	3	
COLLECTED WORKS; GENERAL WORKS	1044	5		2	8	1059	2	6	
PERIODICALS (SOCIETIES, INSTITUTIONS, ETC.)	6514			1	64	6579	39	34	4

SCIENCE	VOLUMES HELD 12-31-89	VOLUMES ADDED: BOOKS ACQUIRED BY: PURCHASE	EXCHANGE	GIFT	JOURNALS	VOLUMES HELD 12-31-90	VOLUMES USED: MUSEUM STAFF	PUBLIC VISITORS	INTER-LIBRARY LOANS
GEOLOGY (CONTINUED)									
GEOGRAPHICAL DIVISIONS	12043	10	4	7	41	12105	32	54	5
MINERALOGY	1295	1		2	7	1305	8	6	
PETROLOGY	424		2		3	429		2	
DYNAMIC & STRUCTURAL GEOLOGY	1691	9		5	4	1709	15	2	
STRATIGRAPHY	581	5	1	7	3	597	12	6	4
PALEONTOLOGY									
PERIODICALS	2120	1			23	2144	54	24	11
COLLECTED WORKS; HISTORY; GENERAL WORKS	459	3	1	4	1	468	16	9	3
STRATIGRAPHIC DIVISIONS									
PALEOZOIC	61	1		2		64	2	2	
MESOZOIC	59			1		60		2	
CENOZOIC	99					99	3	3	
GEOGRAPHICAL DIVISIONS	156	4	1	2		163	4	1	1
PALEOZOOLOGY									
GENERAL WORKS; POPULAR WORKS	152				1	153			
INVERTEBRATES	462	3	4	5	1	475	11	8	3
VERTEBRATES	595	16	2	6		619	21	20	10
PALEOBOTANY	494	1	3	2	4	504	22	4	5
NATURAL HISTORY									
PERIODICALS (GENERAL; INTERNATIONAL)	2182				12	2194	59	29	9
COLLECTIONS; HISTORY; GENERAL WORKS	893	2	2	6	2	905	24	7	
PERIODICALS (SOCIETIES, INSTITUTIONS, ETC.)	12337	4	3	3	65	12412	199	136	50
NATURE CONSERVATION	450	7	1	4	7	469	95	15	4
GEOGRAPHICAL DISTRIBUTION									
PHYSIOGRAPHIC DIVISIONS	1202	1			9	1212	21	3	3
TOPOGRAPHICAL DIVISIONS	1229	13	3	11	2	1258	24	16	2
MICROSCOPY	413	1			1	415	3	1	
BIOLOGY	4041	41	6	12	41	4141	222	47	22
BOTANY									
PERIODICALS (GENERAL; INTERNATIONAL)	2266				18	2284	30	5	
COLLECTED WORKS; POPULAR WORKS; HISTORY; ETC.	1566	7	3	6	2	1584	7	3	1
PERIODICALS (SOCIETIES; INSTITUTIONS; ETC.)	7973			1	74	8048	116	15	8
PLANT-LORE; CLASSIFICATION; MEDICAL BOTANY	1333	8		16	3	1360	42	12	6
GEOGRAPHICAL DISTRIBUTION	5060	23	19	20	9	5131	47	11	10
SPERMATOPHYTA. PHANEROGAMS	3202	18	3	18		3241	61	29	6
CRYPTOGAMS	3716	14	3	74	15	3822	17	2	3
PLANT ANATOMY	325	2	2	3	1	333	18	1	2
PLANT PHYSIOLOGY	443	1	1		5	450	7	4	
PLANT ECOLOGY	503	3	2	1	2	511	7	5	4
ZOOLOGY									
PERIODICALS (GENERAL; INTERNATIONAL)	1786				8	1794	29	5	2
GENERAL WORKS; RESEARCH METHODS	1615	3	1	4	8	1631	21	14	6
PERIODICALS (SOCIETIES, INSTITUTIONS, ETC.)	6218				61	6279	217	65	31
ZOOS; AQUARIA; SPECIAL TOPICS	190	5		3	1	199	9	8	6
GEOGRAPHICAL DISTRIBUTION	1700	6	7	8	6	1727	44	16	6

SCIENCE NATURAL HISTORY ZOOLOGY (CONTINUED)	VOLUMES HELD 12-31-89	VOLUMES ADDED: BOOKS ACQUIRED BY: PURCHASE	EXCHANGE	GIFT	JOURNALS	VOLUMES HELD 12-31-90	VOLUMES USED: MUSEUM STAFF	PUBLIC VISITORS	INTER-LIBRARY LOANS
CLASSIFICATION. SYSTEMATICS. NOMENCLATURE	243					243	20	1	1
INVERTEBRATES									
PROTOZOA; PORIFERA; ECHINODERMATA	390	3		3	1	397	15	7	1
WORMS; OTHER VERMIFORM; BRACHIOPODA; BRYOZOA	294	1	5	1	1	302		2	7
MOLLUSCA	2687	10	2	15	8	2722	32	8	15
ARTHROPODA									
CRUSTACEA; MYRIAPODA, ETC.	381	3	1	3	2	390	2	8	3
ARACHNIDA	481	1	5		2	489	8	3	1
INSECTS	13453	26	24	16	66	13585	199	73	31
VERTEBRATES									
GENERAL WORKS; GEOGR DISTR; PROCHORDATA	78	1	2	1		82	2	4	
FISHES	937	17	6	7	8	975	21	20	13
REPTILES & AMPHIBIANS	1439	53	1	38	5	1536	50	40	43
BIRDS	11208	57	2	27	21	11315	277	107	39
MAMMALS	3805	34	2	18	15	3874	368	93	44
ANIMAL BEHAVIOR & PSYCHOLOGY	1349	3		1	15	1368	47	9	
ANATOMY; EMBRYOLOGY	2393	4		2	11	2410	37	7	
HUMAN ANATOMY	269		1			270	7	1	
PHYSIOLOGY	885	17		1	6	909	29	6	1
MICROBIOLOGY	92	1				93			
MEDICINE	619	1	2	5	7	634	11	9	11
AGRICULTURE	12521	16	11	25	35	12608	83	67	33
TECHNOLOGY	4989	8	1	10	12	5020	44	22	10
MILITARY SCIENCE	59					59	1		
NAVAL SCIENCE	119		1			120		1	
BIBLIOGRAPHY; LIBRARY SCIENCE	5957	13	3	12	35	6020	15	12	9
	236942	797	209	607	1055	239610	4402	2263	673

NOTES:
1. EXCEPT FOR CC (ARCHAEOLOGY), WHICH IS PLACED IN GN.
2. ANTIQUITIES (ARCHAEOLOGY), ETHNOGRAPHIES, SOCIAL LIFE AND CUSTOMS, WHICH LC PLACES IN D-F, ARE INCLUDED IN GN.
3. INDIANS OF THE AMERICAS IN GN 551-574.

SCIENTIFIC

SUPPORT

STAFF

The Biochemical Laboratories

During the last 20 years the biological sciences have experienced revolutionary technological growth, due in great part to major advances in biochemistry, protein chemistry, and molecular genetics. The consequences of these technological breakthroughs have now been felt not only in biology, but throughout society. Many of these techniques have important applications to many disciplines in Natural History - such as systematics - due to their capacity to elucidate the genetic characteristics of organisms.

Some typical situations in the study of Natural History where genetic information can be important are: 1) in systematics, to infer genealogical relationships among a group of organisms to determine how species or populations might have descended from a common ancestor; 2) in biogeography, to determine genetic relationships among groups of populations, such as American Indians, to draw inferences about historical patterns of migration and settlement; 3) in the determination of the evolutionary relationships of humans to other primates; 4) in endangered species propagation programs at zoological parks, where molecular techniques are often used to infer the genetic health of captive populations; and 5) in the genetic characterization of extinct or endangered organisms from the material still contained in dried skins and bone in museum collections.

The Biochemistry Laboratories, a Field Museum research facility, is continuing its development program to establish molecular biological techniques and procedures at the Field Museum as tools for research staff in their studies of long-standing problems in natural history. John G. Hall, Manager of the Biochemical Laboratories, coordinates the development and use of these facilities.

Starch gel electrophoresis of proteins, a technique that has been used for over 25 years in biochemical systematics research, provides information about genetic relationships among organisms and has continued to be employed by Field Museum staff in their work. Scott Lanyon, curator of birds, recently completed the protein electrophoresis aspect of his investigation of relationships among species in the blackbird family, Icteridae; Larry Heaney, curator of mammals, completed an electrophoretic study of Philippine fruit bats; and Town Peterson finished electrophoretic work for his doctoral dissertation at the University of Chicago on the geographical differentiation of populations of scrub jays. Several other electrophoresis research projects involving beetles, birds, and amphibians, are planned in the near future. To accommodate the current demand for electrophoresis research facilities, the Laboratories' equipment continues to be improved with the construction and purchase of more reliable electrophoresis apparatus.

With some startup funding from the Ellen Thorne Smith Fund and from Collections and Research, the Biochemical Laboratories have established a laboratory for the amplification and sequencing of specific genes or gene segments (DNA). The capabilities to target a specific sequence of DNA in the genome, amplify it, and study its properties is the result of a recent technological innovation, known as the polymerase chain reaction (PCR). PCR technology opens the door to the study of genes from organisms that were previously inaccessible to genetic study. It enables the characterization of individual genes from DNA extracted from small pieces of tissue, including dried skins, bone, tissues stored in alcohol, single hairs, and even single cells.

In 1990 the Biochemistry Laboratories produced its first DNA sequence data, obtained with the help of PCR technology. In his studies of blackbirds and other avian groups, Scott Lanyon has produced DNA sequence data from the corresponding 307 base-pair region of the mitochondrial cytochrome b gene for over 65 species of birds, representing 40 genera and 7 families. The total sequence determined to date approximates 20,000 bases, each being a potentially useful character for the reconstruction of evolutionary relationships. The evolutionary relationships inferred from these data have provided important insights into the evolution of several behavioral and ecological characteristics of these birds. Dr. Lanyon is extending this study through amplification and sequencing of other parts of the mitochondrial genome.

Bruce Patterson, a curator in the Division of Mammals, has begun a project to study the biogeographic and evolutionary relationships among the *Artibeus* group of South American fruit bats. This project involves amplifying and sequencing a portion of the ATPase 8 and ATPase 6 genes, also from the mitochondrial genome and known to evolve somewhat faster than the cytochrome b gene. Consequently, the ATPase genes will be more useful for resolving relationships among these closely related species and populations.

As these research projects progress, the Biochemistry Laboratories also has goals 1) to develop protocols to increase the efficiency, reliability, and economy of these technologies, 2) to adapt PCR and DNA sequencing techniques for the genetic analysis of preserved specimens in FMNH collections, and 3) to create more opportunities for the Field Museum scientific staff to use these techniques in their research.

Computing Services

Computing Services is charged with responsibilities for supporting diverse computer activities at Field Museum. During 1990 a large proportion of staff time was allocated to areas other than Research and Collections. Even so, in 1990 Computer Services maintained and improved existing collection management applications for Mammals, Birds, Reptiles and Amphibians, Geology, Anthropology, Insects and Invertebrates. C/Base, is the commercial database software used for all centralized database applications. A menu driven interface allows access to a variety of screens, reports, and editing functions, loan management and label routines.

Computing hardware used to support research and collection activities consists of a Digital Equipment Corporation VAX 11/785, running the Unix 5.3 operating system, more than 120 personal computers and a lowspeed (9600 bps) network connecting the VAX and PCs together; these systems along with a wide range of peripherals such as printers, terminals, plotters, etc., comprise the equipment available to more than 150 researchers and staff.

Also, in 1990 we began considering replacing the VAX 11/785 with another system, upgrading the museum computer network to increase connectivity, adding image processing application software and wide area networking to other research and educational institutions.

Features of wide area networking we are exploring are electronic mail whereby museum staff and researchers may correspond with their collegues at other institutions over a variety of networks. Remote submission of grant proposals, access to databases and software are also other features being considered.

Field Museum Press

Fieldiana is the scientific journal of Field Museum for publication of research by staff and research associates and for publication of information on the collections. Over the years, the journal has embraced many aspects of natural science, from collection catalogs to theoretical treatises. *Fieldiana* has reflected not only the growth and development of Field Museum, but the various sciences it encompasses. The series today is particularly suitable for the publication of monograph length papers that would be difficult to publish elsewhere.

1990 was a year of transition for the aspects that have been handled for many years by a in-house full time managing editor. Following the resignation of Tanisse Bezin, our managing editor, we moved many of these responsibilities to our publishing house, Allen Press. Currently, we have a part time in-house Editorial Coordinator, Marjorie Pannell, and Allen Press has taken over most aspects of publication that follow final acceptance of a manuscript. This new arrangement seems to be working well and it has substantially shortened the time to publication for newly accepted manuscripts.

In 1990, under the scientific editorship of Harold Voris, 14 papers totaling 779 pages were published in all four scientific fields. A backlog of manuscripts has now been cleared, and we are now able to process new monographs immediately. In the 1990s the scientific editor is also developing plans for a new *Fieldiana* series which would focus on interdisciplinary research on the evolution of living systems.

Fieldiana Publications - 1990

Anthropology

No. 14. The Nordenskiold Collection of Eskimo Material Culture from Port Clarence, Alaska. By James W. VanStone; 1990. 56 pages, 30 illus. $16.00 (Publ. 1409).

No. 15. Killke and Killke-Related Pottery from Cuzco, Peru, in the Field Museum of Natural History. By Brian S. Bauer and Charles Stanish; 1990. 17 pages, 17 illus. $9.00 (Publ. 1419).

Botany

No. 24. The Ethnobotany of Chinchero, an Andean Community in Southern Peru. By Christine Franquemont, Timothy Plowman, Edward Franquemont, Steven R. King, Christine Niezgoda, Wade Davis, and Calvin R. Sperling; 1990. 126 pages, 34 illus., 3 tables. $25.00 (Publ. 1408).

No. 25. Falkland Islands (Islas Malvinas) Hepaticae and Anthocerotophyta: A Taxonomic and Phytogeographic Study. By John J. Engel; 1990. 209 pages, 88 illus., 4 tables. $40.00 (Publ. 1416).

Geology

No. 19. Catalog of Type, Figures and Referred Mazon Creek Fossils in Private Collections. By Mary R. Carman; 1990. 29 pages. $9.00. (Publ. 1407).

No. 20. A Preliminary Survey of Fossil Leaves and Well-Preserved Reproductive Structures from the Sentinel Butte Formation (Paleocene) near Almont, North Dakota. By Peter R. Crane, Steven R. Manchester, and David L. Dilcher; 1990. 63 pages, 36 illus., 1 table. $16.00 (Publ. 1418).

Zoology

No. 55. Titis, New World Monkeys of the Genus Callicebus (Cebidae, Platyrrhini): A Preliminary Taxonomic Review. By Philip Hershkovitz; 1990. 109 pages, 47 illus., 13 tables. $22.00 (Publ. 1410).

No. 56. Variability and Significance of Parietal and Ventral Scales in the Marine Snakes of the Genus Lapemis (Serpentes: Hydrophiidae), with Comments on the Occurrence of Spiny Scales in the Genus. By Paul Gritis and Harold K. Voris; 1990. 13 pages, 8 illus., 1 table. $7.00 (Publ. 1411).

No. 57. Mice of the Akodon boliviensis Size Class (Sigmodontinae, Cricetidae), with the Description of Two New Species from Brazil. By Philip Hershkovitz; 1990. 35 pages, 22 illus., 4 tables. $11.00 (Publ. 1412).

No. 58. Report on a Collection of Amphibians and Reptiles from Sichuan, China. By Robert F. Inger, Ermi Zhao, H. Bradley Shaffer, and Guanfu Wu; 1990. 24 pages, 10 illus., 5 tables. $10.00 (Publ. 1413).

No. 59. Systematics of Moths in the Genus Catocala (Lepidoptera: Noctuidae). I. Type Material in the Strecker Collection, with Lectotype Designations. By Lawrence F. Gall and David C. Hawks; 1990. 16 pages, 29 illus. (on 4 plates), 2 tables. $8.00 (Publ. 1414).

No. 60. The Birds of Mt. Isarog National Park, Southern Luzon, Philippines, with Particular Reference to Altitudinal Distribution. By Steven M. Goodman and Pedro C. Gonzales; 1990. 39 pages,6 illus., 5 tables. $12.00 (Publ. 1415).

No. 61. *Hoplomyzon sexpapilostoma*, a New Species of Venezuelan Catfish (Pisces: Aspredinidae), with Comments on the Hoplomyzontini. By Donald C. Taphorn and Crispulo Marrero; 1990. 9 pages, 4 illus., 2 tables. $8.00 (Publ. 1417).

No. 62. Feather Mites of the *Aralichus canestrinii* (Trouessart) Complex (Acarina, Pterolichidae) from New World Parrots (Psittacidae). II. From the Genera *Aratinga* Spix, *Deroptyus* Wagler, *Leptosittaca* Berlepsch and Stolzmann, *Ognorhynchus* Bonaparte, *Pionites* Heine, and *Pyrrhura* Bonaparte, and Conclusions to the Study. By Warren T. Atyeo and Tila M. Perez; 1990. 30 pages, 77 illus. (on 10 plates), 2 tables. $11.00 (Publ. 1420).

Photography

The Photography Department provides a full range of photographic services to the staffs of Collections and Research, Public Programs, Development and Museum Services. The department makes its services and collection available to a diverse audience of museums, educational institutions, publishers, corporations and individuals.

The department is made up of two areas: the Photo Lab and the Photographic Collection. The Collection area is devoted to cataloguing, preserving, researching and maintaining the negatives, slides and transparencies. The collection currently holds over 500,000 images, and grows annually by an estimated 15,000 new images. These images are produced primarily by staff photographers, and include negatives and slides made by curators and researchers. The Lab area is responsible for film processing, printing, duplicating and copying, both in-house and through outside vendors. Staff photographers produce new photography of artifacts and specimens in the department studio, and also photograph events, exhibits and activities throughout the Museum. By late 1990 over 560 new entries (single negatives and multiple slide groups and roll negatives) had been added to the Collection log in five categories: Anthropology, Botany, Zoology, Geology and "General" (history, record and miscellaneous).

Lab Services

In 1990, the Photo Lab processed over 1,000 requests, producing over 7,600 black and white prints, 6,300 negatives, 5,000 35mm slides, 700 large format color transparencies and negatives, 600 Polaroid prints, and over 400 Polaroid slides. Overall production of photographs increased in 1990. With the addition of a Polaroid Bravo slide maker, staff photographers produced 375 percent more Polaroid slides for curators and staff than in 1989.

Staff photographers undertook many exciting photography projects for Museum departments in 1990. This summer, John Weinstein and Diane Alexander White took an early morning helicopter ride and shot color photos of the newly refurbished Field Museum exterior and the surrounding area. These aerial views were later used by Public Relations, Development and Special Events in brochures, proposals and in slide talks. Progress photography assignments included the "Pacific Spirits" exhibit, Bird Hall renovations for the upcoming "Animal Kingdom" project, and a variety of hall closings and deinstallations.

Photos of the new "Traveling the Pacific" exhibit were initially taken for Mike Spock and Phyllis Rabineau's presentations at the American Association of Museums' meetings held in Chicago in May, and have also been submitted to Print Magazine's annual design competition. Dramatic studio photographs of artifacts from the "Pacific

Spirits" exhibit appeared in the 1991 Women's Board calendar and were included in press kits and releases sent to over 1,800 media contacts nationally and internationally. They will also be seen in the forthcoming Field Museum publication *Pacific Journey*. Temporary and traveling exhibits in the Museum were also documented by staff photographers throughout the year.

The photographers were also involved in many assignments for Museum curators and researchers, including on-going work for geologist Lance Grande's paddlefish project, as well as extensive photography for his current Amia project. Among other such projects in 1990 were photographs of over 50 Plains Cree artifacts for Dr. James VanStone's *Fieldiana* publication; stereoscopic views of a fossil rodent skull for Dr. John Flynn; and detailed photos of *M. Fascicularis* (monkey) specimens for publication by Dr. Jack Fooden. The department continued to make portraits and passport photos for museum curators and staff. Our darkroom technician did a considerable amount of printing of negatives from the Botany department's Type Photo collection, as well as research photos shot by curators and researchers.

Grant Project: Preservation of the Photographic Collection

As part of the in-house portion of the National Endowment for the Humanities-sponsored grant project, "Preservation of the Photographic Collection," the darkroom technician transferred over 1,000 deteriorating negatives originally made on cellulose nitrate film to modern "safety" film. Also this year, over 8,000 nitrate negatives were transferred to safety film by an outside photographic conservation firm. Project Director Nina Cummings, with assistance from Mark Alvey, oversaw the cataloguing, shipment and return of the negatives from the Museum to the outside company. In May, John Weinstein and Nina Cummings presented a poster outlining the project at the annual Society for the Preservation of National History Collections (SPNCH) meetings held at the Museum. Included in the collection of negatives are rare photographs taken during Museum expeditions between 1920-1950 which will be preserved for the future.

Outside Sales of Photographs and Permissions

Income derived from over 300 outside sources for photographic services and publications' rights decreased slightly in 1990. Inquiries and research requests from non-paying sources increased to over 450. This year, over $24,500 was received from publishers, authors, museums, educational institutions, corporations and individuals. Gratis prints and permissions rose substantially, from $3,500 in 1989 to over $5,700 in 1990. The department has expanded its program of granting gratis permissions to not-for-profits, such as museums, libraries, universities and scholars.

Prints have been sent at no charge or at a discounted rate in exchange for complimentary copies of publications and in exchange for research and important

caption information. For example, an important collection of rare hand-colored lantern slides was duplicated for Virginia Webb of the Metropolitan Museum of Art. Webb is an expert on the history of the Crane Pacific Expedition of 1928 and provided valuable information on the history of the expedition as well as further identification of the images. The department received over 50 complimentary copies of publications, videodiscs and other items that used images from the Photographic Collection. Attached is a selected list of publications, exhibits and research requests fulfilled in 1990.

Staff Changes

In May, Mark Alvey joined the staff as Department Clerk, after working in the Photography and Film Collection of the Humanities Resource Center (University of Texas). Darkroom Technician Jeanne Zornada left her position in September and moved to London to continue her education. Diane Alexander White, Photographer, left in November on maternity leave. Columbia College graduates Linda Dorman and James Balodimas replaced Ms. Zornada and Ms. White respectively. Both Ms. Dorman and Mr. Balodimas served as Teaching Assistants at Columbia. Dorman's photographs have won awards in numerous shows. During 1990 she has been working on a photo-documentary on cross-country truckers. Mr. Balodimas has worked as a photographer for *The Chicago Tribune*, Perkins and Hill, International Architects, and Concrete Designs, and was assistant curator of a photo exhibit for the Upper Illinois Valley Association.

Photographs from the Department of Photography appeared in the following publications:

Herman J. Viola. *After Columbus*. Smithsonian Books.
Mickey Hart with Jay Stevens. *Drumming at the Edge of Magic*. Harper San Francisco.
A.J.N.W. Prag."Reconstructing King Philip II:The 'Nice' Version." *American Journal of Archaeology* 94.
Patricia Monaghan. *The Book of Goddesses and Heroines*. Llewellyn Publications.
Frank W. Porter III, ed. *The Art of Native American Basketry*. Greenwood Press.
John S. Major. *The Land and People of Mongolia*. J.B. Lippincott.
Kathryn Lasky. *Traces of Life*. Morrow Junior Books.
Compton's Encyclopedia. CD-ROM version.
American Indian Art Magazine 1991 Calendar.
Women Artists. 1991 Calendar. Abbeville Press.
Metalcasting Career Booklet. American Foundrymen's Society, Inc.
Forces of Nature. Time-Life Books.
The Dinosaurs Hunter's Handbook. Running Press.
Michael Kiefer. "Ruth Harkness and the Panda Miracle." *International Wildlife*

Magazine, Sept-Oct Frederick E. Hoxie. *The Crow*. Chelsea House Publishers.
Peter Armitage. *The Innu*. Chelsea House Publishers.
Terri Cohlene. *Dancing Drum*. Rourke Corp.
Dr. David Norman. *The Prehistoric World of the Dinosaur*. Magna Books.
Span magazine. Amoco Oil Co., April 1990.

Pictures from the Department of Photography appeared in the following exhibits:

"Prehistoric Baskets of the Pacific Northwest." Maltwood Art Museum, UVBC.
"Peoples of the Southwest." Maxwell Museum of Anthropology, UNM.
"Chicago in the 1890s." Chicago Historical Society.
Haymond Nature Center, Earlham, Iowa. Exhibit on Iowa's Geologic History.
"Sacred Mountains in Chinese Art." Exhibit catalog. Krannert Art Museum, Univ. of Illinois, and the Metroplitan Museum of Art, NY
Expressways Children's Museum, Chicago.
"Textiles of Luzon." The Museum for Textiles, Toronto.
Museum of the American Indian, N.Y, N.Y. Exhibit of the works of William and Mary Benson.
"Alive! At the Putnam: Dinosaurs, Mammoths, and Man." Putnam Museum, Davenport, IA
"Private Taste in Ancient Rome." Art Institute of Chicago.
"Old Ways, New Ways." (Northwest Coast Indians) The Heard Museum, Phoenix.
Houston Museum of Natural Science. Fossil exhibit.
Hershey Museum of American Life, Hershey, PA. Southwestern Indian Gallery.

The Department of Photography fulfilled the following research and instructional requests:

Auckland Institute and Museum
Metropolitan Museum of Art
Museum of Mankind, London
Menil Foundation
Humboldt State University, Arcata, CA
McKinley Museum of History, Science and Industry, Canton, OH
The Art Institute of Chicago
Minneapolis Institute of Arts
University of New Mexico, Dept. of Anthropology
State Education Dept., University of the State of New York
National Museum of African Art, Washington D.C.
Newark Museum, NJ

LABUSE 1990
1/1/90-11/28/90

	JOBS	B/W PRINTS	B/W NEGs	Polaroid TEST PTS	35mm SLIDES	4x5" COLR TRNS	Polaroid SLIDES
C&R							
Anthropology	70	879	541	46	398	6	0
Conservation	48	452	6	0	2	0	0
Botany	55	1188	218	1	150	9	84
Geology	115	1237	430	94	1437	26	102
Zoology	77	1029	178	26	71	4	198
Library	2	2	4	0	0	0	0
Computing & SSS	1	12	0	0	0	0	0
Photography	292	617	1311	3	378	57	0
VP C&R	1	1	0	0	108	0	0
TOTAL	661	5417	2688	170	2544	102	384
PUBLIC PROGRAMS							
Exhibit Development	10	28	19	5	43	0	0
Production	43	251	763	0	130	0	0
Animal Kingdom	17	122	24	2	0	0	0
Africa	3	159	0	0	0	0	0
Pacific Project	53	253	714	45	1157	32	36
Education	8	100	0	0	202	0	0
VP Spock	5	13	3	0	165	0	0
TOTAL	139	926	1523	52	1697	32	36
DEVELOPMENT							
President	2	60	30	0	0	0	0
Membership	10	133	451	0	0	19	0
Public Relations	83	533	641	57	413	139	0
Women's Board	15	232	473	315	353	221	0
Bulletin	33	121	142	7	0	38	0
Development	14	42	131	0	12	4	0
Sponsored Programs	0	0	0	0	0	0	0
Corporate	0	0	0	0	0	0	0
Tours	1	2	1	0	0	0	0
TOTAL	158	1123	1869	379	778	421	0
MUSEUM SERVICES							
Museum Store	2	2	3	2	0	0	0
VP Croft	0	0	0	0	0	0	0
Personnel	5	44	108	0	0	0	8
FPO	3	13	0	0	4	128	0
Housekeeping	7	69	174	0	0	0	0
Special Events	19	72	6	23	118	31	0
TOTAL	36	200	291	25	122	159	8
GRAND TOTAL	994	7666	6371	626	5141	714	428

Photo Usage by Area
1/1/90-11/28/90

QUANTITY PRODUCED BY AREA	JOBS	B/W PRINTS	B/W 4x5" NEGS	Polaroid TEST PTS	35mm Slides	4x5" COLR TRNS	Polaroid SLIDES
C&R TOTAL	661	5417	2688	170	2544	102	384
PubProg TOTAL	139	926	1523	52	1697	32	36
Development TOTAL	158	1123	1869	379	778	421	0
Museum Serv TOTAL	36	200	291	25	122	159	8
GRAND TOTAL	994	7666	6371	626	5141	714	428

% OF USAGE BY AREA	JOBS	B/W PRINTS	B/W Negs	Polaroid TEST PTS	35mm SLIDES	4x5" COLTRANS	Polaroid SLIDES
C&R	66%	71%	42%	27%	49%	14%	90%
Public Prog	14%	12%	24%	8%	33%	4%	8%
Development	16%	15%	29%	61%	15%	59%	0%
Museum Services	4%	3%	5%	4%	2%	22%	2%

Scanning Electron Microscope

The Scanning Electron Microscope facility is a part of the Scientific Technical Support Services.

The Scanning Electron Microscope (SEM) and its ancillary equipment together serve as a multi-user research facility for all staff and students working in the Collections and Research area at Field Museum. The SEM has been an invaluable resource for both original research observations and documentation of results for the departments of Anthropology, Botany, Geology and Zoology for nearly two decades.

With the support of the National Science Foundation and the Elizabeth F. Cheney Foundation, Field Museum purchased a state-of-the-art AMRAY 1810 Scanning Electron Microscope in May 1989. Problems with the original instrument, including breakdowns and difficulties in obtaining replacement parts, had led to a steady decline in the number of SEM users and the quality of results obtained. In addition, technological advances over the last twenty years had rendered many of the features of the original SEM virtually obsolete.

Installation of a new SEM has dramatically expanded the range of SEM applications that can now be undertaken at Field Museum and has also resulted in a major increase in SEM use. Examination time of samples with the SEM ("viewing time") over the last year exceeded 600 hours. Thirty curators, professional staff, students, and research associates in Collections and Research along with six visiting scientists have employed the SEM in their research in 1990. Researchers obtained over 2000 publishable SEM photographs.

Scanning electron microscopy is particularly valuable for examining fine surface details of three-dimensional objects at magnifications ranging from 5x to 50,000x. Some of the current research projects at Field Museum that utilize the SEM include: studies of the structure and biology of fossil plants, investigations of the structure of jaws and teeth of small mammals, and analyses of the effect of freezing (a commonly used preservation technique) on anthropological collections. Other SEM research projects are the examinations of the morphology of staphyliniform beetles, fungal spores, fruits of the plant family Compositae, mouth parts of tadpoles, jaws and teeth of land snails, and a variety of both living and fossil fish.

Betty Strack, a part-time staff member, manages the SEM facility. Her duties include supervising the use of the SEM, maintaining detailed records of its use, and providing assistance to staff in their SEM research projects. Betty also keeps the facility in good operating condition which includes performing routine maintenance on instruments.

Scholarship Committee

The Field Museum supports the use of its collections and facilities by outside scholars and students. The Scholarship Committee is responsible for the review of applications and the disbursement of funds for visiting scientists, graduate fellows and undergraduate interns who wish to work with the Museum's collections or collaborate with its scientists. The Scholarship Committee administers seven separate funds. These include the Borg-Warner Visiting Scientist Fund, the Rowley Fund, the Schmidt Fund, the Thomas J. Dee Fellowship Fund, the Armour Fund, the Louer Fund, and the Undergraduate Internship Fund.

During the 1989-90 period, the Scholarship Committee, chaired by Lance Grande, made awards to about 35 individuals in each of the four scientific departments. Of these awards, approximately 1/3 were given to exceptional graduate or undergraduate students who have demonstrated a strong commitment to the study of natural history. The remaining awards were given to scientists from around the world, including scholars from Chile, China, England, India, Israel, Malaysia, Mexico, Poland, Sweden, USSR, and Venezuela, as well as numerous scientists from the United States and Canada.

SCHOLARSHIPS AND INTERNSHIPS AWARDED 1990

Borg-Warner Robert O. Bass Visiting Scientists
(for the support of visiting scientists)

William E. Bemis
Sankar Chatterjee
Thomas Duncan
Mikhail A. Fedonkin
Else Marie Friis
K. M. Leelavathy
Antonio Machado-Allison
Leticia Pacheco Mota
James H. J. Penny
Beata Maria Pokryszko
Robert B. Stuebing
Adam Urbanek

William A. and Stella M. Rowley Scholars
(for the education of worthwhile students in a field related to the purposes of the Museum)

Mavis Blacker
Patricia Poleski

Karl P. Schmidt Scholars
(for the training of young scientists
who desire to study at the Museum)

Tristan J. Davis
William Hahn
Paul D. Heideman
Nina Ingle
Santiago Reig
Victor Sanchez-Cordero

Thomas J. Dee Fellows
(for research and academic fellowships with priority given to younger, less well established research workers and to graduate students)

Gloria Arratia
Cesar F. Ascorra
Gorden Bell
William E. Bemis
Christopher E. Carlton
Mario C. C. de Pinna
Jerry W. Dragoo
John Friel
Favio Gonzalez
Liora Kolska Horwitz
Clark L. Ovrebo
James Pakaluk
Anne H. Walton
Yu Jinping

Lester Armour Family Graduate Fellows
(ensures the permanent support of at least one outstanding graduate student)

Terry C. Grande

Rose M. Louer Fellow
(benefits the education of Illinois students or work by students in Illinois natural history of anthropology)

Andrea B. Taylor

Internships
(work experience whereby an undergraduate or recent graduate gains hands-on training in his/her field of expertise for one or more semesters)

Heather L. Jencks
Margie Lisnich
Susan L. Mailen
Jean Porterfield
Jeffrey Provisor
Jorge Quintana
Matthew Seddon

Prince Scholars
(visiting scholar fund to attract high quality scientists and scholars)

William E. Browne

Scientific Illustration

The four museum scientific illustrators are Zorica Dabich, B.F.A.; Zbigniew Jastrzebski, M.F.A.; Clara Richardson Simpson, M.S.; and Marlene Werner, B.S., A.A. Dr. John Engel supervises their activities. All of the illustrators are professional artists with a broad background in drawing and painting and many years of experience in both art and natural history illustration. They are charged with production of illustrations of various subjects, fulfilling the need for visual description of research material. The diversity of research interests of the curatorial staff is reflected in the wide variety of specimens and artifacts illustrated. Virtually all illustrations are produced from actual objects of scientific study, and include descriptive visual presentations, complicated reconstructions of artifacts, skeletal structures and fossil plants and animals. The illustrations are used as an explanatory supplement to the research conducted by the curatorial staff, and appear in various publications, including Fieldiana.

Each of the scientific illustrators is able to employ a broad range of techniques and media, and works with a diversity of subjects. However, each illustrator has refined a particular technique. For example, water color paintings of South American monkeys and drawings of botanical subjects utilizing crow quill are the specialities of Zorica Dabich. Clara Richardson Simpson excels in line and stipple representations of zoological and paleontological specimens. Marlene Werner excels in utilizing carbon dust and scratch board techniques of fossil and extant subjects. Zbigniew Jastrzebski has special expertise with pencil or pen and ink stipple rendering of skeletal structures as well as reconstructions of vessels for the anthropology staff.

Staff illustrators are involved in other activities relevant to their profession. Werner, Simpson and Dabich are involved in exchange of professional knowledge with the Guild of Natural Science Illustrators and the Chicago Artists Coalition. Dabich taught drawing classes as part of the Museum Adult Education series, and Jastrzebski taught night courses in scientific illustration at the Art Institute. Werner, Simpson and Jastrzebski have published numerous articles on drawing and painting techniques.

COLLECTIONS AND RESEARCH

VOLUNTEERS

Anthropology
Dee Aiani
Dodie Baumgarten
Garland Brown
Sol Century
Peter Coey
Jim Coplan
Ralph Cowan
Connie Crane
Jeanette Delaney
Molly Donovan
Paul DuBrow
Jack Ewing
Madeleine Garceau
Peter Gayford
Ann Gerber
Margaret Goes
Leah Goldberg
Robert Gowland
Lisa Heidel
Noreen Jolley
Lisa Labinger
Jane Levin
Betty Lewis
Valerie Lewis
Kathy Lutarewych
Jack Macdonald
Andrew MacLeod
Sam Mayo
Theresa McGill
Withrow Meeker
Carolyn Moore
George Morse
Mary Nelson
Louise Neuert
Irmgard Nirschl-Rauch
Laura Nunez
Paula Phillips
Dorothea Phipps-Cruz
Llois Stein
Margo Thayer
Ika Tomaschewsky
Julius Wagman
Theresa Williams
Wang-Fai Wong
Ed Yastrow

Botany
Arun Dabholkar
Liz Farwell
William Gillespie
Terry Gillespie
Dennis Hall
Nancy Harlan
Sharon Kramer
Sandra Lee
Lillie Mannings
Margaret Martling
Selwyn Mather
Naomi Pruchnik
Martha Singer
Dan Snydacker
Haidee Trainer
Randy Upton

Geology
Barbara Ballard
Irene Broede
Sophia Brown
Elizabeth Cook
Aldona Dziedzic
Jane Edmunds
Michael Henderson
Philip Keener
Jennifer Lambert
Manuel Matanguihan
John McConnell
Donald Newton

China Oughton
Angie Shaw
Julie Teetsov

Zoology
Neal Abarbanell
Paul Baker
John Beery
Lorin Brown
Robert Brunner
Sophie Ann Brunner
Paul Bryan
Robert Cary
Clayton Dean
Sheila Demkovich
Stanley Dvorak
Betsy Ebert
M. Alison Ebert
Joseph Fisher
Ron Garner
John C. Goeb
Thomas Gnoske
Henry Greenwald
Gregory Guliuzza
Dorothy Karall
William Kephart
Scott Kuipers
Susan Knoll
Larry Misialek
Susan Moy
Lorain Olsen
Thomas Pavela
Sheila Reynolds
Thomas Simon
Jack Sloan
Janet Madenberg Stevens
Virginia Turner-Erfort
David Walker
Maxine Walter
Laura Zaidenberg

Library
John Craib-Cox
Elizabeth Dilworth
Arden Frederick
Robert Gowland
Ruth Howard
Mabel Johnson
Dorothy Oliver
Christopher Quinn
James Reed
Marie Rosenthal
James Skorcz
Worthington Smith

Photography
Reeva Wolfson

Field Museum of Natural History
Collection Size - 1990

Collection	Number of Specimens
Anthropology	
Central American Archaeology	11,730
Central American Ethnology	2,671
South American Archaeology	16,891
South American Ethnology	8,085
North American Archaeology	135,086
North American Ethnology	99,542
Osteological Collection	4,750
Polynesian Ethnology/Archaeology	5,271
Micronesian Ethnology/Archeology	11,273
Asian Archaeology	1,196
Asian Ethnology	52,379
Near Eastern Archaeology	25,202
Near Eastern Ethnology	665
Old World Prehistory	161,257
Classical Archaeology	11,804
African and Madagascar Ethnology	16,528
Australian Ethnology	2,130
Melanesian Ethnology	36,174
Subtotal	602,634
Botany	
Algae	78,170
Fungi	86,551
Lichens	52,169
Bryophytes	166,274
Ferns	96,197
Seed Plants	2,037,317
Subtotal	2,516,678
Geology	
Physical Geology	62,889
Invertebrate and Plant Paleontology	397,459
Vertebrate Paleontology	133,470
Subtotal	593,818
Zoology	
Amphibians and Reptiles	243,965
Birds	389,710
Fishes	1,722,380
Insects	9,642,207
Invertebrates	3,810,000
Mammals	140,046
Subtotal	15,948,308
TOTAL	19,661,438

TEN YEAR COLLECTION GROWTH

	Anthro	Botany	Geology	Zoology	Total
1981	595,684	2,230,634	509,701	12,011,366	15,346,951
1990	602,634	2,516,678	593,818	15,948,308	19,661,438

USE OF COLLECTIONS BY LOAN
1990

Department	Number of Loans	Specimens Loaned	Specimens Borrowed
Anthropology	31	493	176
Botany	218	20,493	2,283
Geology	56	451	32
Zoology	313	16,408	1,149
Total	618	37,845	3,620

Net Loaned
(Total loaned-borrowed) = 34,225

SCHOLARLY USE OF COLLECTIONS BY VISITORS
1990

Department	Number of Professionals	Number of Students	Number of Others
Anthropology	357	176	181
Botany	120	20	8
Geology	79	30	11
Zoology	195	369	182
	751	595	382